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ABSTRACT

The report presents summaries of findings from three substudies dealing with the early interaction patterns between handicapped infants and their mothers. The first substudy compared dyads composed of handicapped and nonhandicapped infants and their mothers. Analysis of videotaped observations, questionnaires and diaries completed by mothers revealed that the looking patterns of the two groups were more similar than not, although the similarity may diminish with age. Influences of age and mother vocalization on infants' toy play behavior were noted. Results suggested that mothers of handicapped children must make greater effort to promote parent-child interaction than mothers of nonhandicapped children. Substudy 2 provided a more in-depth analysis of the interactions of seven dyads, five with handicapped babies and two with normally developing infants. The final substudy tested the efficacy of direct intervention on the interactive process between three mothers and babies. Findings stressed the importance of the interactions being pleasurable for both participants and demonstrated that intervention can change the nature of social interaction by making it more pleasurable and communicative. (CL)

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THE DEVELOPMENT OF BEHAVIORAL SYNCHRONY IN SOCIAL COMMUNICATION: THE EXCEPTIONAL INFANT

Dr. Jeanette A. (Walker) McCollum

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FINAL REPORT

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THE DEVELOPMENT OF BEHAVIORAL SYNCHRONY IN SOCIAL COMMUNICATION: THE EXCEPTIONAL INFANT

(#G008001795)

Dr. Jeanette A. (Walker) McCollum
Principal Investigator

EC161832

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CHAPTER 1

INTRODUCTION AND REVIEW OF RELEVANT LITERATURE

Recent research has stressed the importance of the infant's social interaction network for his cognitive, language and social/emotional development. It has also become increasingly apparent that the infant is a major contributor in determining the quantity and quality of the interactions in which he is engaged. In addition, the prediction of later outcomes (perhaps especially for the infant with handicaps) is extremely dependent on the nature of the caretaking environment of which the interactions are a part (Sameroff & Chandler, 1975). The handicapped infant is therefore developmentally at-risk not only because of his handicaps, but because of the effect that these handicaps may have on his primary caregivers, and thus on the interactions in which he participates. While the nature of these interactions is critical, little research has been directed toward describing their characteristics, determining how they differ from normal, examining why they differ, or exploring how differences relate to development.

REVIEW OF SELECTED RESEARCH

From the moment of birth, the infant becomes a member of a social system within which his caregivers represent his first and most salient communicative partners. The functions that early dyadic social interactions serve in assuring caregiving and the development of attachment have been discussed by a number of individuals (e.g., Freedman, 1974; Emde, Katz & Thorpe, 1978; Schaffer, 1977). The relationships between the characteristics of the infant-caregiver relationship and cognition (Stern, et al., 1977; Bruner, 1975), and between these characteristics and affective development (Ainsworth & Wittig, 1969) further illustrate the pervasive importance of the quality of early dyadic social interaction as a context for many kinds of learning. The developmental process is virtually imbedded within the communicative structure between infant and caregiver, and its characteristics influence all areas of development (Bruner, 1975; Newsom, 1977; Tronick, Als & Adamson, 1979). As a window to development, bouts of dyadic interaction also provide an excellent medium through which to examine the changing effects of the infant on the nature of the exchange, and thus the mutual adaptations and bidirectional influences between caregiver and baby.

Interaction between caregivers and their babies, as between any two individuals, is characterized by a smooth and seemingly effortless integration of interpersonal behaviors. While it may appear effortless, however, dyadic interchange is possible only because each member of the dyad conforms to certain regularities which are understood and responded to by the other (Duncan, 1972), thereby combining individual streams of behavior into sequences of interrelated behaviors. The communicative signals of each member thus help to define the moment to moment role that the other member will play in the interaction.

Interactions in which one member of the dyad is a baby obviously differ from those of adult dyads in the manner in which this interpersonal regulation occurs. In adult conversation, the behavior of interactants is structured to allow a smooth integration and flow of communicative behaviors (Duncan, 1972; Duncan & Fiske, 1977; Kendon, 1967). For example, patterns of vocalization (e.g., rising intonation at the end of a phrase) and the looking behavior of both speaker and listener (e.g., the speaker's looking toward the listener's face) are strong predictors of who takes the active turn, and thus of the structure of the dialogue between the two actors. Such signals, and not necessarily the same ones, have been found to be important determinants of sequence of behavior in mother/ infant dyads as well (Collis, 1978; Jones, 1980). For example, by 12 months of age, there is very little overlap in vocalization between mother and baby (Schaffer, Collis & Parsons, 1977); rather, vocalization occurs in alternating sequences, as in adult conversation. The lack of overlaps is thought to be due to (a) the tendency of the infant to vocalize in burst-pause patterns, and (b) the mother's filling in the gaps, creating the "pseudo-dialogue" described by Schaffer, et al. (1977). Further, by 5 months, infants are responding to at least some features of the turn-yielding signals which operate in conversations between adults (Kozak & Tronick, 1981).

Gaze direction also predictably affects the structure of the interaction. The young baby's looks at the mother's face are highly related to mutual gaze and to mother vocalization (Stern & Gibbon, 1977). The meanings which the mother attaches to different directions of the baby's gaze change as the infant changes; by 10-12 months, the mother uses the baby's looks at elements outside of the face-to-face interaction to formulate the content of her own verbalizations to the baby (Bruner, 1975, Collis, 1977), and responds to the baby's brief glances at her face as if they were direct and intentional communicative acts (Jones, 1980). In essence, the mother of the young infant "frames" the baby's actions with continual watching, and plays the role of constant listener, always ready to take an active role (Fogel, 1977).

In interactions between adults, roles tend to be not only complementary but reciprocal (equal) and interchangeable (either member can fill the same role); this is clearly not the case where one member is an infant, and the burden of maintaining the interaction rests with the caregiver. While the roles are neither reciprocal nor interchangeable, however, they become more so over time, as the interactions gradually change to true dialogues. Further, they are, from the beginning, complementary to each other: at all points, integration of communicative behaviors is far from random.

Elegant evidence of this matching process may be found in the characteristics of face-to-face interaction between mothers and young babies. The caregiver's exaggerated facial movement and vocalization, repetition of visual, vocal, tactile and kinethetic stimulation, and regular cycling of levels of affect, are all very different from what the same caregiver displays in interaction with other adults (Brazelton, Tronick, Adamson, Als & Wise, 1975; Stern, Beebe, Jaffe & Bennett, 1977). These adaptations are not only ideally suited to the young baby's emerging perceptual and physiological characteristics; they also provide precisely the kind of stimulation which allows him to begin to predict and gradually to control interactive sequences, and thus to assume an increasingly reciprocal role in the interaction (Ratner & Bruner, 1977). As the baby begins to exhibit more control, the caregiver gradually and very naturally adjusts her own interactive behavior, allowing these abilities to be practiced, and "raising the ante" to encourage the baby's newly emerging abilities (Bruner, 1982; Murphy, 1978). As the baby becomes increasingly interested in objects, the mother further adjusts her own interactive role in ways which are ideally suited to maintaining a social interactive context for cognitive and language learning, using the baby's direction of gaze and involvement with toys to interpret his focus of interest, and then responding verbally to that focus (Collis, 1977). She thus establishes a dialogue between herself and the baby in ways which are highly related to later development (Cross, 1978).

While the rules and signals used to integrate the interactive behaviors of two members of a dyad differ and are adjusted to match both the capabilities of the two partners and the characteristics and intent of the interactive situation (e.g., play as compared to caregiving or teaching), it is clear that the success of this integration is highly dependent upon the capabilities of each of the individual members of the dyad. It is also clear that this process is not negotiated equally successfully in all dyads. If either member possesses interactive qualities which deviate to any great extent from what is typical, then it might be expected that the process of integration would not proceed nearly as smoothly, with implications for the affective relationship between the members, for the learning which normally occurs in those interactions at that point in development, and for the elements of the baby's later development which might be affected by the quality of interactions at that earlier point.

It is not surprising that the interactions of dyads in which one member is a handicapped baby have been found to differ in a number of ways from those in which the baby is normal. Als, Tronick and Brazelton (1980) have reported the lack of differentiated facial signals in blind infants, and the feelings of incompetence that mothers have in being unable to elicit social responses from their infants. Fraiberg (1974) has also noted the trouble that parents have in "reading" the communicative signals of their blind babies. Down dyndrome babies have been described as having less intense smiles than do normal babies, making them more difficult to interpret (Emde, et al., 1978). Down syndrome babies have also been found to deviate in their patterns of vocalization and gaze during social interactions (Jones, 1980); vocalizations, rather than occurring in a burst-pause pattern, contained few pauses, making it difficult for the mothers to become a partner in the dialogue. Further, these same babies did not as clearly display referential looking at their mothers' faces during toy play, with the consequence that the mothers could not as easily define their own roles in relation to the babies' focus of attention, and thus could not enter into a dialogue with the babies. Gaze differences in DS babies have also been described by Berger and Cunningham (1981) and by Krakow and Kopp (1982). Babies with multiple handicaps have been found to display a narrower range of behavior and to be less predictable in their affective response to maternal interaction (Walker & Kershman, 1981).

When these and other differences (Berry, Gunn & Andrews, 1980; Buium, Rynders & Turnure, 1974) are found in various groups of (or in individual) handicapped babies, it is to be expected that differences will also be found in the caregivers of those babies in their efforts to adjust their own behaviors to match those of the babies. Caregivers of handicapped babies have in fact been described as alternating between extremes of apathy and vigorous activity (Walker & Kershman, 1981), as being more directive (Jones, 1980; Gutman & Rondal, 1979), and as relying heavily on kinesthetic forms of stimulation (Greenberg, 1971).

It is quite clear even from the limited research in this area that differences do exist, and ongoing research is gradually clarifying the variety of differences that occur in both babies and mothers. A major question that has not been systematically asked, however, is why these differences occur. This question has major implications for understanding the handicapped baby's development and for planning intervention strategies that will result in maximally supportive interactions. The failure to ask this question not only prematurely assumes that identical mechanisms explain development in handicapped and nonhandicapped babies (Walker & Crawley, 1982), but that intervention should be directed toward making the interactions of dyads with handicapped babies as much like those of dyad with nonhandicapped babies as possible. Neither assumption is necessarily valid. A major factor in the failure to ask "Why" is that until recently most developmental research with infants has not been theoretically based (Kopp, 1982). This is even more of a factor with handicapped infants; research has tended to simply compare them to normal babies. Thus, few hypotheses have been either generated or tested which focus specifically on the functions of various interactive behaviors in social exchanges between handicapped babies and their caregivers; whether differences are adaptive in relation to these functions; whether they are adaptive for fostering further development; whether, once adaptive differences are identified, they can be learned by the adult member of the dyad; and whether altering these behaviors affects the quality of the interaction.

PURPOSE

The purpose of this project was to examine the early interaction patterns between handicapped infants and their mothers. The primary issues of concern were: (a) the effects of handicaps on the integration of communicative behaviors of infant and mother into a dyadic interaction in different situations; (b) the adaptive value of the mother's communicative behavior in relation to differences between handicapped and nonhandicapped babies; and (c) the efficacy of intervening into social interaction for the purpose of effecting more mutally pleasurable involvement. Three related sub-studies were designed for this purpose: (a) a longitudinal comparison of groups of dyads containing handicapped and nonhandicapped babies; (b) more intensive case studies of a small number of dyads with diversely handicapped babies; and (c) single subject intervention studies with a small number of dyads. Measurement was based primarily on videotaped observations in the home, but included several different ratings, a home diary and developmental testing. Emphasis in the first year was on the first two sub-studies, and included subject selection, development of instrumentation, and initiation of data collection. In the second year, data collection continued, and the primary emphasis became the development and intiation of procedures for data analysis. Data collection for sub-studies 1 and 2 continued into the third year, ending for each family as the baby reached the 30th (for Sub-study 1) or 36th (Sub-study 2) month birthdate. Sub-study 3 was also initiated during Year 2.

This final report will include a summary of selected results and general conclusions from each of the three sub-studies. A summary of project administration and non-research project objectives and activities will conclude the report. Much additional data has been collected, coded and summarized than has been feasible to analyze and interpret in the time available. Additional results which are not covered in this narrative have been included in Appendix A, and are organized by modality and individual (e.g., "mom face"); a list of table may be found at the beginning of that Appendix.

CHAPTER 2

SUB-STUDY I: GROUP COMPARISON

Sub-study I was designed as a comparison between two groups of mother-infant dyads, one containing 11 handicapped infants, and one containing 13 normally developing infants. The issues addressed were (a) the communicative channels used by babies and mothers, (b) the characteristics of dyadic states describing the combinations of channels across mother-baby dyads, (c) mothers' perceptions of their babies' interactive capabilities and the circumstances under which interaction usually occurs, (d) differences between groups and situations, and (e) changes in these patterns over time. The temporal sequencing of dyadic states was also of interest in terms of the roles of mother and baby in determining the course of the interaction.

Five observations were made of each dyad (and for many of the dyads, six observations), beginning at 12 months of age and repeating at 6 month intervals until the baby was 30 months of age. It was also possible to begin observation of several of the babies at their six month birthdates, resulting in six total observations. However, because at this age level the handicapped babies were all boys, these data were not included in the analyses to be reported here.

POPULATION

Dyads with handicapped infants were drawn from infant intervention programs within a 75-mile radius of Champaign-Urbana, and included 11 infants with a wide range of sensory, motor and cognitive disabilities. Thirteen dyads with nonhandicapped infants were identified through newspaper announcements and personal contact, and were matched by group with the handicapped babies on the variables of age, gender and race. Families were also matched by group, with characteristics of the families of the handicapped infants determining the selection of families with nonhandicapped infants. All mothers were English speaking, with one Black dyad in each group; the remaining dyads were Caucasian. All but one infant in each group were from two-parent families; the average birth order for the infants in each group was 1.6. The infants are described in Table 1, while Table 2 outlines family characteristics for both groups.

Two home visits were made to each family within ± one week of each of the six-month birthdays. The first visit was used to obtain informal assessments of the baby's level of functioning in order to plan the intervention tasks for videotaping. The Bayley was also administered at this visit. The 24-hour diary and a questionnaire/rating forms were also left with the mother, to be completed by the following week. At the second visit, the dyad was videotaped in six 4-minute interaction situations, with the four play situations occurring in a predetermined order. Play and feeding situations were taped wherever they occurred most naturally. After the taping, the mother was asked to rate the baby's behavior in the videotaped situation in comparison to his usual behavior.

INSTRUMENTATION

A variety of instruments were used. These are described below, and are included in full in Appendix B.

1. Videotaped observations - Dyads were videotaped in their homes in six consecutive situations, with the order of the four play situations remaining constant across dyads. Each situation lasted approximately four minutes; three minutes

Table 1
Characteristics of Sample of SubStudy 1

Subj.	Primary Diagnosis	Age of Entry	Gender	6-Month Bayley Mental	6-Month Bayley Motor	12-Month Bayley Mental	12-Month Bayley Motor	18-Month Bayley Mental	18-Month Bayley Motor	24-Month Bayley Mental	24-Month Bayley Motor	30-Month Bayley Mental	30-Month Bayley Motor
HC 101	Multiply Handicapped	6	M	<50 +	<50	<50	<50	<50	<50	<50	<50	<50	<50
HC 102	Chromosomal Anomalie	6	M	<50	74	<50	<50	<50	50	<50	<50	<50	50
HC 103	Multiply Handicapped	12	F	---	---	<50	<50	<50	<50	<50	<50	<50	<50
HC 104	Mental Retardation	12	F	---	---	54	78	70	60	72	<50	92	<50
HC 105	Downs Syndrome	12	F	---	---	83	75	75	53	56	56	--Dropped--	
HC 106	Multiply Handicapped	6	M	50	60	86	50	76	65	91	99	86	80
HC 107	Physically Handicapped	12	F	---	---	110	82	95	119	117	126	106	129
HC 108	Multiply Handicapped	6	M	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
HC 110	Multiply Handicapped	6	M	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
HC 111	Profoundly Deaf	12	F	---	---	91	111	130	104	81	121	74	102
HC 112	Chromosomal Anomalie	12	F	---	---	<50	<50	<50	<50	<50	<50	<50	<50

+: <50 refers to raw scores below the norms of 50

Table 1 (continued)

Table cont.

Subj.	Primary Diagnosis	Age of Entry	Gender	6-Month Bayley Mental	6-Month Bayley Motor	12-Month Bayley Mental	12-Month Bayley Motor	18-Month Bayley Mental	18-Month Bayley Motor	24-Month Bayley Mental	24-Month Bayley Motor	30-Month Binet & Mental	30-Month Binet & Motor
NHC151	Normal	6	M	134	127	142	111	>150 #	113	143	126	152	---
NHC152	Normal	6	M	89	100	122	98	96	84	98	99	97	---
NHC153	Normal	6	F	124	146	131	117	109	117	127	102	100	---
NHC154	Normal	6	F	124	120	119	111	119	94	116	108	109	---
NHC155	Normal	6	M	124	127	147	111	>150	>150	>150	150	149	---
NHC156	Normal	6	F	116	104	120	99	115	113	112	150	108	---
NHC157	Normal	6	M	134	116	130	128	105	120	132	150	120	---
NHC158	Normal	6	F	92	92	94	82	95	112	100	93	91	---
NHC159	Normal	12	M	---	---	130	111	>150	107	150	114	115	---
NHC160	Normal	12	F	---	---	109	92	98	100	109	90	115	---
NHC161	Normal	12	F	---	---	109	105	121	81	127	118	115	---
NHC162	Normal	12	F	---	---	134	111	111	138	150	150	114	---
NHC163	Normal	12	F	---	---	117	98	115	107	106	108	89	---

#: >150 refers to raw scores above the norms of 150

&: NHC subjects were given a Binet at age 30 months since many had passed all or a majority of the Bayley items by 24 months; the Binet has no motor subtest

Table 2
Family Characteristics of Subjects in SubStudy 1

Subj.	Birth Order	Number of Children	Number of Parents	Age of Mom at Birth of Subj.	Race	Education of Mom +	Family Income
HC101	2	2	2	22	White	2	10-15,000
HC102	3	3	2	31	White	2	5-10,000
HC103	1	1	2	26	White	3	10-15,000
HC104	1	2	2	29	White	4	20-25,000
HC105	5	5	2	37	White	2	10-15,000
HC106	1	1	2	16	White	1	<5,000
HC107	10	11	2	34	White	2	10-15,000
HC108	1	2	2	22	White	2	10-15,000
HC110	1	2	2	25	White	2	10-15,000
HC111	1	3	1	18	Black	2	<5,000
HC112	2	2	2	27	White	2	25-30,000
NHC151	2	2	2	31	White	4	25-30,000
NHC152	3	4	2	31	White	4	20-25,000
NHC153	1	1	1	21	Black	2	5-10,000
NHC154	1	2	2	22	White	4	10-15,000
NHC155	1	3	2	23	White	2	10-15,000
NHC156	2	2	2	28	White	4	15-20,000
NHC157	1	2	2	19	White	2	20-25,000
NHC158	6	6	2	38	White	2	15-20,000
NHC159	2	2	2	26	White	4	20-25,000
NHC160	3	3	2	24	White	2	20-25,000
NHC161	1	1	2	30	White	2	20-25,000
NHC162	1	1	2	22	White	2	15-20,000

+: Education of Mom 1=less than high school diploma, 2=high school diploma to some college, 3=Junior College or technical degree, and 4=college or advanced degree.

(180 seconds) were coded for the analyses. In all situations, the mother chose where she wished to sit, within the constraints of keeping the face of each member of the dyad within camera view.

a. Play with no toy/no instruction - This was a spontaneous face-to-face interaction in which the mother was asked to play with her infant as she usually did.

b. Play with toy/no instruction - The mother was asked to play with her infant as she usually did, using a familiar toy.

c. Play with no toy/instruction - The mother was given a particular objective to work on with the infant, with the objective selected individually for each dyad at each taping session based on developmental assessment and observation at that birthdate.

d. Play with toy/instruction - As in the no toy/instruction situation, the objective was designed individually for each visit, with the mother using a toy furnished by the project.

e. Feeding - The observation session was scheduled at the regular mealtime, or when the baby might be expected to want a snack. Mother and baby were seated in their usual feeding position, and the mother was asked to use the most recently developed skill level (e.g., using a cup).

f. Dressing - The mother was asked to change the baby's diaper or to undress and dress the baby.

2. Developmental testing - The Bayley Scales of Infant Development were administered at each six month birthdate. For those babies who developed beyond the levels covered by the Bayley, the Stanford-Binet was substituted. These measures were used for description of the samples, not as a dependent variable.
3. Diary - At each visit, parents were asked to complete a 24-hour diary of major events in the infant's life during this period, including with whom these events occurred.
4. Play Behavior Questionnaire/Rating (PBQR) - This instrument was used at each birthdate to obtain the mother's perception of the characteristics of interactive situations, and of the baby's interactive behaviors.
5. Baby Play Rating Scale (BPRS) - Mothers completed this instrument immediately following the six videotaped situations, rating the baby's responsiveness both during the tapings and during the past week in order to obtain an estimate of the validity of the data obtained from videotaping.
6. Mother Play Rating Scale (MPRS) - This instrument, completed by coders, was used to obtain a measure of the mother's responsiveness to the babies during the videotaped situations.

CODING AND DATA SUMMARY

Videotapes

Each situation from the videotapes made at each age level was coded separately for the modalities of baby gaze, vocalization and face, and for mother gaze, vocalization, face and kinesthetic. Each set of codes thus required at least one separate pass through each situation taped of each dyad at each age level. Coding was done on the MORE System, an electronic coding device which records the time of entry and duration of each code. Following each coding session, the coder entered the data at a computer terminal, and edited it for errors. Group data files were then created for each group (mother/baby, handicapped/nonhandicapped) for each modality (e.g., handicapped baby vocs), and summarized into frequency, total duration and mean duration for each code at each age level and in each situation. These were the data which were used for group comparisons.

Coders were trained to a minimum reliability of 80%. Both inter- and intra-coder reliability were then checked regularly (initally every 5-10 tapes, and then every 10-15 tapes); retraining occurred when any coder fell below 80%. All data used for analyses were thus coded at ≥ 80% reliability. These data are summarized in Table 3.

Ratings by Coders

Ratings using the MPRS were completed for the 6, 12 and 18 month age levels. One single rating was made after viewing all four play situations, with the average reliability ranging from 80-89%. Results for this scale have not yet been analyzed.

Ratings/Questionnaires Completed by Mothers

For results from the PBQR and the BPRS, each completed by the mother at each age level, means and standard deviations were calculated for each item separately. For the purposes of this report, particular items were then selected for further analysis. Items from the BPRS were also

TABLE 3

Intracoder and Intercoder Reliability:* As Percent Agreement

	Intracoder Reliability			Intercoder Reliability		
	Mean	S.D.	Range	Mean	S.D.	Range
BABY GAZE	85.80	4.09	80-91	82.36	3.35	80-91
MOM GAZE	87.21	4.69	82-95	82.88	3.21	80-89
BABY FACE	86.36	4.04	82-93	84.28	3.81	80-88
MOM FACE	83.90	2.55	81-88	83.99	3.40	81-91
BABY VOCS	91.58	2.61	87-95	88.71	4.34	80-95
MOM VOCS	83.85	4.34	80-91	81.20	1.86	80-85
MOM KINESTHETIC	97.70	2.21	95-100	91.96	4.59	83-98

* Average of all reliabilities over the 3 year course of the study

grouped into temperament and cognition categories which were analyzed in the same way.

Diary

Raw data were coded from the diaries into a number of superordinate categories. Mean and standard deviations were then computed for each group at each age.

For this report, data analysis and interpretation have been limited to selected portions of the data. Data collection for all dyads at all ages was not completed until April, 1983, two months prior to the end of the project. Because of the multiple steps involved in coding, data reduction and analysis, it was therefore not feasible to include analyses and interpretation for each modality at each age level in this report. Furthermore, the large number of possible analyses made selection of particular portions of the data desirable on conceptual grounds as well. Selecting particular portions for analysis also made it possible to develop and test analysis procedures for addressing each of the different issues of concern in this project; these same procedures will be used for additional analyses of these data after this project is ended.

RESULTS: VIDEOTAPES

Frequencies, mean durations and total durations were calculated for each code in each of three expressive modalities for the baby (gaze, vocalization and facial expression), and in each of four expressive modalities for the mother (gaze, vocalization, facial expression and movement of the baby's body). These data are included in Appendix A for all six age levels from 6-30 months. (Note that within the Appendix, data is organized by person and modality, as listed).

Data sets and analyses to be discussed here include:

1. Analysis of variance of gaze patterns of mothers, babies and dyads in Situations 2 and 4 at 12 and 24 months of age, with contingent probabilities for dyadic gaze continuations; lag analysis is also included for 12 months;
2. Analysis of variance of leader-follower transitions in dyadic gaze states at 12 months of age in Situations 2 and 4;
3. Analysis of vocalization patterns of mothers and babies in Situations 2 and 4 at 12 and 24 months of age, including separate analyses of variance for babies, mothers and dyads, and conditional probabilities for relationships between partners; also included is an analysis of variance on baby vocalization in Situation 1 at 5 ages;
4. Analysis of the relationships between baby gaze and mother vocalization, including analysis of variance of states created by combining these two modalities, and conditional probabilities for relationships between partners.

Most of these analyses are thus related to an examination of gaze and vocalization, with an emphasis on gaze. The twelve and 24 month age levels have also received emphasis, primarily because they were the first complete data sets available for analysis.

Section 1:

Characteristics of Gaze in Toy Situations

The two major concerns in this set of analyses were (a) whether looking patterns might represent a more general problem area in communication for a wider variety of handicapped babies than previously studied, and (b) the possible influences of adding instructional objectives into toy play interactions between mothers and babies. Differing gaze patterns could directly affect the regulation and integration of roles of mother and baby, and thus the quality of their toy interactions as situations which facilitate development and learning. Further, while most handicapped babies probably spend a greater portion of their interaction time in instructional situations, little is known about the ways in which instruction differs in quality from more playful situations. It might be expected that, in situations in which the mother has a predetermined agenda, the impact of the baby's looks on her behavior would differ from that in more playful situations. Given the importance of the intervention situation in the lives of handicapped babies, understanding how various capabilities of the baby may influence its characteristics was chosen as a particularly crucial area in which to concentrate analyses.

The following discussions of the directions of gaze of babies, mothers and dyads will include data from Situations 2 (toy play) and 4 (toy instruction) at both the 12 and 24 month age levels. It should be noted that the data sets for the dyads with handicapped babies contain results for a blind baby; in his case, facial orientation was used in place of gaze. (Further analyses with these data excluded have been completed at the 12 month level; a separate paper containing the results has been submitted for publication.)

For each set of analyses at each age level, a 3-way analysis of variance was used on each measure (frequency, mean duration and duration), and included the variables of code, situation and group. A subsequent 2-way ANOVA was then used on each measure for each code separately. For example, the frequency, mean duration and duration of "baby look at toy" were each subjected to a separate 2 (situation) x 2 (group) analysis.

In the case of the dyadic states, conditional probabilities were also calculated and analyzed using z-scores to determine whether directions of gaze of mothers and babies occurred together in any predictable patterns.

Directions of Baby Gaze

Twelve Months. Tables 4-7 show that in these two toy situations, babies spent most of their time engrossed in the toys. Of the three directions of looking, babies looked at their mothers least frequently. Looks at the toys lasted longer, and occupied more of the interaction time, than looks in either of the other two directions. However, the handicapped babies changed directions more frequently. Further, they had relatively longer episodes of looking at their mothers' faces, and spent relatively more of the interaction looking away, while the nonhandicapped babies took longer looks, and hence looked for more of the interaction, at the toys being used. Looks away accounted for more time in the handicapped group; differences in frequency and mean duration also approached significance (p=.06 and .10 respectively).

In comparisons between the two toy situations, it was found that in Situation 4 (instruction) the babies changed directions less frequently, concurrently taking significantly shorter looks at their mothers' faces and away and significantly longer looks at the toys, than they did in play. Overall, the instruction situation was characterized by significantly more visual orientation to the toys than was play. While situation x group interactions were not significant, the situation effect was generally greater for the group of nonhandicapped babies.

Thus, at 12 months, both groups of babies were more visually oriented to the toy than to their mothers or other elements of the environment, and this was even more characteristic of the instruction situation.

TABLE 4

Two-way ANOVA Summary Table:
Baby Gaze at 12 Months

SOURCE	Frequency DF	SS	F	PROB.	Duration DF	SS	F	PROB.	Mean Duration DF	SS	F	PROB.
LOOK AT FACE												
Group	1	31.10	2.42	0.13	1	748.73	3.73	0.07	1	27.98	8.99	0.01
Error	22	282.15	----	----	22	4410.75	----	----	22	68.49	----	----
Situation	1	63.85	4.56	0.04	1	294.18	1.35	0.26	1	5.67	4.73	0.04
Sit*Group	1	17.85	1.27	0.27	1	179.18	0.82	0.37	1	1.44	1.20	0.28
Error	22	308.07	----	----	22	4786.30	----	----	22	26.36	----	----
LOOK AT TOY												
Group	1	38.49	1.23	0.28	1	19056.67	7.39	0.01	1	20128.49	8.72	0.01
Error	22	686.43	----	----	22	56758.81	----	----	22	50766.64	----	----
Situation	1	269.43	13.17	0.00	1	6483.43	7.32	0.01	1	23372.72	8.45	0.01
Sit*Group	1	44.71	2.19	0.15	1	880.93	0.99	0.33	1	7346.87	2.66	0.12
Error	22	450.20	----	----	22	19479.55	----	----	22	60821.31	----	----
LOOK AWAY												
Group	1	89.55	3.80	0.06	1	10672.56	6.75	0.02	1	129.07	2.87	0.10
Error	22	518.12	----	----	22	34762.75	----	----	22	989.71	----	----
Situation	1	126.55	8.86	0.01	1	3462.36	3.59	0.07	1	129.73	4.55	0.04
Sit*Group	1	42.80	3.00	0.10	1	104.02	0.11	0.74	1	13.73	0.48	0.49
Error	22	314.12	----	----	22	21216.45	----	----	22	626.77	----	----

Table 5

Three-way ANOVA Summary Table:
Baby Gaze at 12 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
Group	1	150.43	4.17	0.05	1	18.13	1.27	0.27	1	5227.06	7.00	0.01
Error	22	792.79	----	----	22	313.36	----	----	22	16427.05	----	----
Situation	1	460.33	14.32	0.00	1	1.29	0.11	0.74	1	6491.66	7.41	0.01
Sit*Group	1	101.54	3.16	0.09	1	12.38	1.07	0.31	1	2594.30	2.96	0.10
Error	22	707.21	----	----	22	255.28	----	----	22	19284.65	----	----
Direction	2	499.37	15.83	0.00	2	476042.63	109.53	0.00	2	59713.77	37.11	0.00
Grp*Direction	2	8.71	0.28	0.76	2	30459.83	7.01	0.00	2	15058.47	9.36	0.00
Error	44	693.90	----	----	44	95618.94	----	----	44	35397.79	----	----
Sit*Direction	2	36.10	2.17	0.13	2	10233.13	4.98	0.01	2	17057.57	8.89	0.00
Grp*Sit*Direction	2	3.82	0.23	0.80	2	1151.75	0.56	0.58	2	4767.73	2.49	0.09
Error	44	365.18	----	----	44	45227.03	----	----	44	42189.78	----	----

Tukey's ($p \leq .05$)

Frequency: Toy, Away > Face
Duration: Toy > Away, Face
Mean Duration: Toy > Away, Face

TABLE 6

Two-way ANOVA Summary Table:
Baby Gaze at 24 Months

SOURCE	Frequency DF	Frequency SS	Frequency F	Frequency PROB.	Duration DF	Duration SS	Duration F	Duration PROB.	Mean Duration DF	Mean Duration SS	Mean Duration F	Mean Duration PROB.
Look at Face												
Group	1	104.76	3.37	0.08	1	1266.99	4.98	0.04	1	5.75	2.29	0.14
Error	22	683.90	----	----	22	5600.83	----	----	22	55.14	----	----
Situation	1	53.50	1.87	0.18	1	452.82	1.46	0.24	1	5.07	3.19	0.09
Sit*Group	1	3.92	0.14	0.71	1	3.32	0.01	0.92	1	0.14	0.09	0.76
Error	22	629.75	----	----	22	6838.66	----	----	22	34.97	----	----
Look at Toy												
Group	1	137.64	3.93	0.06	1	36061.67	9.74	0.00	1	16647.62	18.03	0.00
Error	22	770.36	----	----	22	81466.81	----	----	22	20310.17	----	----
Situation	1	286.36	10.67	0.00	1	4328.88	8.07	0.01	1	3985.44	4.07	0.06
Sit*Group	1	0.36	0.01	0.91	1	273.04	0.51	0.48	1	286.92	0.29	0.59
Error	22	590.55	----	----	22	11794.94	----	----	22	21563.75	----	----
Look Away												
Group	1	344.62	13.80	0.00	1	19170.14	8.67	0.01	1	149.41	4.86	0.04
Error	22	549.30	----	----	22	48648.84	----	----	22	676.67	----	----
Situation	1	94.17	7.38	0.01	1	2327.51	6.82	0.02	1	43.56	3.27	0.08
Sit*Group	1	0.84	0.07	0.80	1	7.51	0.02	0.88	1	5.87	0.44	0.51
Error	22	280.83	----	----	22	7507.97	----	----	22	292.98	----	----

TABLE 7

Three-way ANOVA Summary Table:
Baby Gaze at 24 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
Group	1	547.60	11.44	0.00	1	83.72	1.91	0.18	1	4362.85	16.64	0.00
Error	22	1053.37	----	----	22	963.27	----	----	22	5768.50	----	----
Situation	1	386.52	8.48	0.01	1	6.45	0.13	0.72	1	997.21	3.13	0.09
Sit*Group	1	4.08	0.09	0.77	1	47.69	0.93	0.34	1	120.09	0.38	0.55
Error	22	1002.89	----	----	22	1123.97	----	----	22	7015.91	----	----
Direction	2	404.25	9.36	0.00	2	46257.23	77.75	0.00	2	37714.15	54.32	0.00
Grp*Direction	2	39.42	0.91	0.41	2	56415.07	9.21	0.00	2	12439.92	17.92	0.00
Error	44	950.19	----	----	44	134753.20	----	----	44	15273.48	----	----
Sit*Direction	2	50.04	2.21	0.12	2	7104.57	6.25	0.00	2	3051.97	4.51	0.02
Grp*Sit*Direction	2	1.04	0.05	0.96	2	236.18	0.21	0.81	2	172.84	0.26	0.78
Error	44	498.24	----	----	44	25017.60	----	----	44	14875.80	----	----

Tukeys ($p \le .05$)

Frequency:	Toy, Away > Face
Duration:	Toy > Away, Face
Mean Duration:	Toy > Away, Face

However, nonhandicapped babies were relatively more toy oriented, while handicapped babies looked relatively more at their mothers (accounted for primarily by larger mean durations) and away (accounted for by tendencies to look away both more frequently and for longer durations).

Twenty-four Months. As at 12 months, the babies were still more oriented to the toy than to their mothers or other elements of the environment. However, the handicapped babies still changed directions more frequently, now tending to look in each of the three directions more than the nonhandicapped babies (at toy: p = .06; at face: p = .08; away: p = .00). Group differences in the mean duration of looking at the toy remained (longer in nonhandicapped), while a new group difference in the mean duration of looking away had appeared (longer in handicapped). The group difference in the mean duration of looks at their mother had, however, disappeared. In terms of total duration, the handicapped babies now looked away and at their mothers for significantly more of the interaction, while nonhandicapped babies look at the toys for significantly more of the interaction.

Comparisons between situations showed that, in the instruction situation as compared to play, the babies looked less frequently in each of the three directions, and spent significantly more time looking at the toys and less time looking away. Mean durations approached significance for all three directions, with looks at the toys tending to be longer (p = .06), and looks at their mother (p = .09) and away (p = .08) tending to be shorter, in instruction than in play.

No statistical comparisons were made between patterns of looking at 12 and 24 months. However, visual analysis of the means indicates that the two groups of babies in general became less similar as they got older. At

24 months, the handicapped babies changed directions more frequently than they had at 12, while the nonhandicapped babies did the opposite. Mean durations of looking at their mothers differed little from 12 months, but in the handicapped group, looks away were longer, and looks at the toys were shorter, than at 12 months. Again, the opposite pattern was found in the nonhandicapped babies. Overall, nonhandicapped babies had changed very little between the two ages in the relative proportion of time spent looking in the three directions, while the handicapped babies had become less toy oriented, and more oriented to their mothers and away.

While group differences had become larger, gaze patterns in the two situations had become somewhat more similar. Differences between the two situations were in the same directions as at 12 months, but there was less disparity between the two, and the two situations no longer tended to have differential quantitative effect in the two groups.

Gaze Directions of Mothers

In all human social interaction, the direction of gaze of each member serves monitoring and signalling functions which help to define and regulate the complementary roles of the two members of the dyad at each successive moment in the interaction. When one member of the dyad is a baby, the burden of regulation is on the adult member, and the baby's gaze is critical in defining how the caregiver accomplishes this. It was therefore expected that analyses of the gaze patterns of the mothers would reflect situational differences related to their roles, i.e., that less visual monitoring of the babies would be necessary in instruction than in play simply because there was less need to interpret the focus of baby's interest. It was also anticipated that differences between the two groups of mothers would indicate that both groups adapted their own interactions to the capabilities of, and differences between, their babies.

Twelve Months. The results (Tables 8-11) show that, unlike their babies, the mothers divided their looks fairly evenly between their babies' faces and the toy. Looks away were infrequent and short. As found with the babies, the instruction situation, when compared to play, was characterized by less frequent changing of direction, more looking at the toys and less looking at their babies' faces and away, with looks at the toys being significantly longer in mean duration than the other two. However, while in the mothers of the nonhandicapped babies this pattern was found for all three measures, it was true only of total duration in the mothers of the handicapped babies. In the instructional situation, mothers of the handicapped babies instead looked back and forth between their babies' faces and the toys more frequently than in play, with mean durations of looks at their babies and away lasting proportionately longer than in the nonhandicapped group. The mean duration of looks in each direction were therefore more similar in the two situations than was found in the nonhandicapped group. In contrast, in instruction the mothers of the nonhandicapped babies looked back and forth less, with looks at the toys being relatively longer and those at their babies and away relatively shorter. Mothers of the nonhandicapped babies overall spent significantly more time looking at the toys, while mothers of the handicapped babies spent significantly more time looking at their babies' faces.

Twenty-four Months. As at 12 months, the mothers rarely looked away, instead alternating their looks fairly equally between their babies and the toys. Looks at their babies and at the toys did not differ significantly in length or in overall duration. Again, however, mothers of the

TABLE 8

Two-way ANOVA Summary Table:
Mother Gaze at 12 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
LOOK AT FACE												
Group	1	0.22	0.00	0.96	1	31400.31	13.29	0.00	1	232.95	10.28	0.00
Error	22	1713.09	----	----	22	51986.66	----	----	22	498.55	----	----
Situation	1	6.36	0.35	0.56	1	3089.46	4.56	0.04	1	23.07	4.73	0.04
Sit*Group	1	35.70	1.94	0.18	1	470.46	0.69	0.41	1	0.45	0.09	0.76
Error	22	404.62	----	----	22	14908.36	----	----	22	107.29	----	----
LOOK AT TOY												
Group	1	83.49	1.07	0.31	1	18873.82	6.16	0.02	1	60.25	0.78	0.39
Error	22	1718.99	----	----	22	67457.43	----	----	22	1708.87	----	----
Situation	1	9.62	0.37	0.55	1	11837.44	11.04	0.00	1	98.89	3.04	0.10
Sit*Group	1	62.12	2.41	0.13	1	1142.19	1.07	0.31	1	102.47	3.15	0.09
Error	22	567.36	----	----	22	23590.48	----	----	22	715.10	----	----
LOOK AWAY												
Group	1	0.01	0.00	0.97	1	0.02	0.00	0.98	1	7.00	11.34	0.00
Error	22	140.66	----	----	22	1130.45	----	----	22	13.58	----	----
Situation	1	75.11	7.48	0.01	1	378.11	4.57	0.04	1	7.79	6.01	0.02
Sit*Group	1	9.11	0.91	0.35	1	9.77	0.12	0.73	1	0.02	0.01	0.91
Error	22	220.81	----	----	22	1818.71	----	----	22	28.50	----	----

TABLE 9

Three-way ANOVA Summary Table:
Mother Gaze at 12 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
Group	1	31.39	0.34	0.57	1	532.70	4.36	0.05	1	34.31	1.44	0.24
Error	22	2046.94	----	----	22	2687.63	----	----	22	525.81	----	----
Situation	1	25.88	0.88	0.36	1	360.29	4.11	0.06	1	1.78	0.22	0.64
Sit*Group	1	94.91	3.21	0.09	1	26.88	0.31	0.59	1	28.94	3.59	0.07
Error	22	649.51	----	----	22	1930.12	----	----	22	177.30	----	----
Direction	2	3731.19	53.80	0.00	2	180071.55	33.60	0.00	2	1046.22	13.58	0.00
Grp*Direction	2	52.33	0.75	0.48	2	49741.46	9.28	0.00	2	265.88	3.45	0.04
Error	44	1525.80	----	----	44	117886.91	----	----	44	1695.18	----	----
Sit*Direction	2	69.29	2.81	0.07	2	14924.82	8.55	0.00	2	127.90	4.18	0.02
Grp*Sit*Direction	2	12.01	0.49	0.62	2	1595.54	0.91	0.41	2	74.00	2.42	0.10
Error	44	543.28	----	----	44	38387.42	----	----	44	673.59	----	----

Tukeys ($p \leq .05$)

Frequency:	Face, Toy > Away
Duration:	Toy, Face > Away
Mean Duration:	Toy, Face > Away

TABLE

Two-way ANOVA Summary Table:
Mother Gaze at 24 Months

SOURCE	Frequency				Duration				Mean Duration			
	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
LOOK AT FACE												
Group	1	95.59	1.36	0.26	1	29908.45	9.82	0.00	1	252.97	9.95	0.00
Error	22	1550.66	----	----	22	66976.55	----	----	22	559.43	----	----
Situation	1	6.30	0.25	0.62	1	1300.72	1.49	0.23	1	3.02	0.40	0.54
Sit*Group	1	127.64	4.98	0.04	1	255.39	0.29	0.59	1	0.64	0.08	0.77
Error	22	563.36	----	----	22	19181.28	----	----	22	167.11	----	----
LOOK AT TOY												
Group	1	38.79	0.74	0.40	1	26709.15	7.59	0.01	1	6747.74	5.37	0.03
Error	22	1147.21	----	----	22	77385.52	----	----	22	27663.07	----	----
Situation	1	0.28	0.01	0.91	1	2310.07	2.15	0.16	1	0.02	0.00	1.00
Sit*Group	1	55.28	2.46	0.13	1	1421.82	1.32	0.26	1	77.53	0.05	0.82
Error	22	494.38	----	----	22	23682.85	----	----	22	31069.63	----	----
LOOK AWAY												
Group	1	0.76	0.30	0.59	1	2.17	0.12	0.74	1	1.95	0.68	0.42
Error	22	55.24	----	----	22	409.75	----	----	22	62.72	----	----
Situation	1	0.36	0.21	0.65	1	0.00	0.00	0.99	1	0.11	0.06	0.81
Sit*Group	1	0.11	0.07	0.80	1	0.08	0.01	0.93	1	0.38	0.21	0.65
Error	22	37.55	----	----	22	233.92	----	----	22	39.88	----	----

TABLE 11

Three-way ANOVA Summary Table
Mother Gaze at 24 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
Group	1	94.91	1.28	0.27	1	40.21	0.63	0.43	1	1401.58	3.53	0.07
Error	22	1637.17	----	----	22	1397.76	----	----	22	8742.27	----	----
Situation	1	4.20	0.14	0.72	1	47.27	1.08	0.31	1	1.03	0.00	0.96
Sit*Group	1	112.79	3.66	0.07	1	153.18	3.51	0.07	1	34.81	0.08	0.78
Error	22	678.54	----	----	22	960.83	----	----	22	9687.29	----	----
Direction	2	2839.29	55.97	0.00	2	306241.96	46.99	0.00	2	12582.05	14.16	0.00
Grp*Direction	2	40.22	0.79	0.46	2	56579.55	8.69	0.00	2	5601.08	6.31	0.00
Error	44	1115.95	----	----	44	143374.06	----	----	44	19542.95	----	----
Sit*Direction	2	2.52	0.13	0.88	2	3562.62	1.86	0.17	2	1.91	0.00	1.00
Grp*Sit*Direction	2	70.24	3.71	0.03	2	1524.12	0.80	0.46	2	43.74	0.04	0.96
Error	44	416.76	----	----	44	42137.22	----	----	44	21589.32	----	----

Tukeys ($p \overline{<} .05$)

Frequency:	Toy, Face > Away
Duration:	Toy > Face > Away
Mean Duration:	Toy > Face, Away

handicapped babies looked relatively more at their babies' faces and away, while mothers of the nonhandicapped babies looked for relatively longer episodes and for more of the interaction at the toy.

No differences were found between situations at 24 months; the differences found at 12 months in the frequency of looking away (less with instruction), had disappeared. However, the situation x group interaction in the frequency of looking at the babies' faces was now significant: in instruction, as compared to play, mothers of handicapped babies looked at their babies more frequently, while mothers of nonhandicapped babies looked less frequently. A similar but nonsignficant pattern was apparent for looking at the toy: each of these reflected tendencies already seen at 12 months.

Group differences were the same at the two ages: the total duration and mean duration of looking at the toys (more in the nonhandicapped group) and at their babies' faces (more in the handicapped group), had remained. Overall, then, as reported for the babies, situational differences were not as apparent at 24 as at 12 months, while group differences were more apparent. In general, at 12 months the groups of mothers had been more similar to each other in instruction than in play. At 24 months, they were more similar in play.

As with the babies, visual inspection of the means indicated changes across the two age levels. At 24 months, mothers looked less frequently in each of the three directions. Further, looking at the toys accounted for less of the interaction time, while looks away accounted for more than at 12 months. The two groups of mothers differed across the age levels in total time looking at their babies' faces: at 24 months, mothers of the handicapped babies spent more time looking at the babies, while mothers of the nonhandicapped babies spent less, than at 12. Differential changes across age were also seen in the mean duration measures: in the nonhandicapped mothers, looks at the toys lasted longer at 24 months, while in the handicapped group, they were shorter. Mothers of handicapped babies also took shorter looks at their babies at 24 months than at 12 months, while mothers of nonhandicapped babies took longer looks at 24 months, particularly in the play situation. Visual inspection also showed that, as at 12 months, the two situations affected the two groups of mothers differently in terms of the frequency of looking back and forth between their babies and the toys: in the nonhandicapped group, mothers looked back and forth less often in the instruction situation than they had at 12 months, while in the handicapped group, they looked back and forth more often.

Thus, the looking patterns of both groups of mothers reflected the types of changes in their babies from 12 to 24 months. Mothers of the nonhandicapped babies, like their babies at 24 months, looked at the toys for longer episodes, and for more of the interaction time, than they looked in either of the other two directions. Mothers of the 24 month old handicapped babies, also like their babies, now spent proportionately more time looking at their babies' faces and away, and less time looking at the toys. As at 12 months, however, this match was most evident in the total duration measure. Unlike their babies, both groups of mothers looked at their partners' faces for significantly more time than they looked away.

Patterns of Dyadic Gaze States in Toy Situations

The separate analyses for babies and mothers presented above yielded results which, while interpreted in relation to each other, nevertheless do not address the issue of how the gaze patterns of mother and baby were actually integrated together. Each of the various gaze codes for the babies were therefore combined wth each of those for their mothers (including the "look at body" code), creating dyadic gaze states. In the sections which follow, these states will be discussed in various ways. The states will be referred to in each section as follows (note that the baby's direction of gaze always appears first, followed by the mother's):

TT=toy/toy; joint looking at toy
TF=toy/face
FF=face/face; mutual gaze
FT=face/toy
AF=away/face
AT=away/toy
AB=away/body
TB=Toy/body
AA=away/away
BA=body/away
TA=toy/away
FA=face/away

Occurrence of Dyadic Gaze States. Only the first eight of these states were included in this first set of analyses; others were eliminated because of their very low frequencies and total durations. Analysis procedures were identical to those described above for gaze patterns of babies and mothers separately.

Twelve months--Results (Tables 12-16) indicate that two states, TF and TT, accounted for most of the interaction time, with TT accounting for significantly more than TF; interactions between state and group, however, showed that while dyads with nonhandicapped babies engaged in more TT than TF, dyads with handicapped babies showed the opposite pattern, engaging in more TF than TT. Mean durations showed the same type of interaction. The third most prevalent state was AF. States in which the mother looked at the babies' bodies, and states in which the mother alone looked at the toy, seldom occurred. Mutual gaze was also uncommon in the toy situation, with an overall average total duration

TABLE 12

Frequency of Dyadic Gaze in Toy Situations at 12 Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Baby Look Face/ Mom Look Face	4.45	3.08	3.45	3.75	3.31	5.34	0.38	0.65
Baby Look Face/ Mom Look Toy	1.27	1.68	1.64	3.59	1.15	1.91	0.15	0.38
Baby Look Toy/ Mom Look Face	12.36	7.26	14.00	7.95	15.38	7.73	13.08	6.60
Baby Look Toy/ Mom Look Toy	8.91	6.20	11.18	7.37	14.54	8.29	14.62	4.68
Baby Look Toy/ Mom Look Body	1.45	2.16	0.21	0.47	3.54	3.84	2.08	3.35
Baby Look Away/ Mom Look Face	9.09	7.13	5.73	6.34	4.00	2.48	0.62	0.96
Baby Look Away/ Mom Look Toy	3.18	2.04	3.73	4.63	3.62	3.18	1.31	1.93
Baby Look Away/ Mom Look Body	2.36	5.92	0.55	1.04	2.08	2.33	0.08	0.28

e cont.

(DG 12 mon)

TABLE 13

Duration of Dyadic Gaze in Toy Situations at 12 Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Baby Look Face/ Mom Look Face	11.18	10.15	7.73	10.87	6.23	10.19	0.46	0.78
Baby Look Face/ Mom Look Toy	1.55	2.07	4.09	9.88	1.85	2.85	0.15	0.38
Baby Look Toy/ Mom Look Face	54.82	34.78	62.55	49.89	44.77	25.08	36.69	27.84
Baby Look Toy/ Mom Look Toy	47.18	51.31	60.00	51.65	76.77	42.27	124.08	41.64
Baby Look Toy/ Mom Look Body	3.82	6.03	1.09	2.43	11.38	14.17	6.54	10.51
Baby Look Away/ Mom Look Face	37.09	38.50	22.36	35.66	8.62	7.56	0.77	1.24
Baby Look Away/ Mom Look Toy	5.82	3.92	12.27	19.14	5.85	5.29	2.54	3.69
Baby Look Away/ Mom Look Body	5.45	14.86	1.27	2.53	7.23	9.22	0.85	3.05

TABLE 14

Mean Duration of Dyadic Gaze in Toy Situations at 12 Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Baby Look Face/ Mom Look Face	1.95	1.50	1.71	0.94	1.17	0.98	0.38	0.65
Baby Look Face/ Mom Look Toy	0.64	0.64	0.77	1.15	0.66	0.99	0.15	0.38
Baby Look Toy/ Mom Look Face	4.29	2.02	3.89	2.87	2.96	1.00	2.63	0.97
Baby Look Toy/ Mom Look Toy	4.88	6.42	5.20	6.16	5.63	3.05	9.67	5.44
Baby Look Toy/ Mom Look Body	0.90	1.33	1.09	2.43	1.99	1.67	1.19	1.83
Baby Look Away/ Mom Look Face	3.44	2.77	2.35	1.99	1.86	1.03	0.49	0.69
Baby Look Away/ Mom Look Toy	1.72	0.98	1.72	2.09	1.37	0.84	0.98	1.26
Baby Look Away/ Mom Look Body	0.68	0.98	0.65	1.17	2.83	3.45	0.85	3.05

TABLE 15

Two-way ANOVA Summary Table:
Dyadic Gaze at 12 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
Baby Look Face/ Mom Look Face (FF)												
Group	1	52.97	3.90	0.06	1	444.64	5.33	0.03	1	13.20	10.29	0.00
Error	22	298.84	----	----	22	1836.84	----	----	22	28.24	----	----
Situation	1	45.85	3.55	0.07	1	253.46	3.42	0.08	1	3.14	3.52	0.07
Sit*Group	1	11.02	0.85	0.37	1	15.96	0.22	0.65	1	0.87	0.98	0.33
Error	22	284.46	----	----	22	1628.52	----	----	22	19.67	----	----
Baby Look Face/ Mom Look Toy												
Group	1	7.64	1.98	0.17	1	39.39	1.73	0.20	1	1.03	1.67	0.21
Error	22	84.84	----	----	22	501.27	----	----	22	13.60	----	----
Situation	1	1.20	0.23	0.64	1	2.17	0.08	0.78	1	0.42	0.54	0.47
Sit*Group	1	5.54	1.04	0.32	1	53.50	1.91	1.81	1	1.20	1.55	0.23
Error	22	117.27	----	----	22	617.75	----	----	22	17.11	----	----
Baby Look Toy Mom Look Face (TF)												
Group	1	13.11	0.14	0.71	1	3840.03	2.25	0.15	1	19.87	5.40	0.03
Error	22	2091.89	----	----	22	37464.89	----	----	22	81.01	----	----
Situation	1	1.34	0.10	0.76	1	0.36	0.00	0.98	1	1.60	0.53	0.47
Sit*Group	1	46.34	3.32	0.08	1	744.11	1.00	0.33	1	0.01	0.00	0.95
Error	22	306.66	----	----	22	16368.55	----	----	22	65.70	----	----

Table 15 (continued)

		Frequency				Duration				Mean Duration		
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
aby Look Toy/												
om Look Toy (TT)												
Group	1	244.70	3.42	0.08	1	26136.25	7.81	0.01	1	81.13	1.89	1.83
Error	22	1575.30	----	----	22	73075.66	----	----	22	942.00	----	----
Situation	1	16.45	0.82	0.38	1	10770.05	10.69	0.00	1	56.57	3.93	0.06
Sit*Group	1	14.36	0.72	0.41	1	3543.80	3.52	0.07	1	41.21	2.86	0.10
Error	22	441.55	----	----	22	22167.20	----	----	22	316.72	----	----
aby Look Toy/												
om Look Body (TB)												
Group	1	45.04	3.91	0.06	1	504.56	3.80	0.06	1	4.12	0.83	0.37
Error	22	253.63	----	----	22	2918.92	----	----	22	108.93	----	----
Situation	1	20.82	4.26	0.05	1	170.88	3.04	0.10	1	1.12	0.60	0.45
Sit*Group	1	0.23	0.05	0.83	1	13.38	0.24	0.63	1	2.90	1.54	0.23
Error	22	107.43	----	----	22	1237.94	----	----	22	41.44	----	----
aby Look Away/												
om Look Face (AF)												
Group	1	310.12	9.47	0.01	1	7468.75	11.13	0.00	1	35.32	13.47	0.00
Error	22	720.36	----	----	22	14766.90	----	----	22	57.67	----	----
Situation	1	135.67	10.82	0.00	1	1518.06	2.48	0.13	1	18.20	5.20	0.03
Sit*Group	1	0.00	0.00	0.99	1	141.06	0.23	0.64	1	0.23	0.07	0.80
Error	22	275.81	----	----	22	13475.94	----	----	22	77.02	----	----

Table 15 (continued)

		Frequency				Duration				Mean Duration		
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
Baby Look Away/ Mom Look Toy (AT)												
Group	1	11.75	1.37	0.25	1	280.67	2.84	0.11	1	3.57	1.43	0.24
Error	22	188.92	----	----	22	2172.99	----	----	22	54.82	----	----
Situation	1	9.25	0.87	0.36	1	29.50	0.30	0.59	1	0.46	0.39	0.54
Sit*Group	1	24.25	2.29	0.14	1	283.92	2.92	0.10	1	0.44	0.37	0.55
Error	22	232.75	----	----	22	2141.75	----	----	22	26.12	----	----
Baby Look Away/ Mom Look Body (AB)												
Group	1	1.70	0.15	0.70	1	5.43	0.07	0.80	1	16.36	1.67	0.21
Error	22	246.30	----	----	22	1835.55	----	----	22	215.68	----	----
Situation	1	43.43	5.28	0.03	1	332.62	4.67	0.04	1	12.09	4.25	0.05
Sit*Group	1	0.10	0.01	0.91	1	14.46	0.20	0.66	1	11.38	4.00	0.06
Error	22	180.82	----	----	22	1567.36	----	----	22	62.55	----	----

TABLE 16

Three-way ANOVA Summary Table:
Dyadic Gaze at 12 Months

	Frequency				Duration				Mean Duration			
SOURCE	**DF**	**SS**	**F**	**PROB.**	**DF**	**SS**	**F**	**PROB.**	**DF**	**SS**	**F**	**PROB.**
Group	1	5.13	0.12	0.73	1	4.57	0.19	0.67	1	0.43	0.07	0.79
Error	22	935.09	----	----	22	538.91	----	----	22	128.63	----	----
Situation	1	115.50	11.24	0.00	1	54.71	2.57	0.12	1	7.48	4.34	0.05
Sit*Group	1	60.65	5.90	0.02	1	9.05	0.42	0.52	1	0.37	0.22	0.65
Error	22	226.09	----	----	22	468.99	----	----	22	37.95	----	----
State	7	8581.60	41.72	0.00	7	265342.68	43.55	0.00	7	1251.84	20.05	0.00
Grp*State	7	681.90	3.32	0.00	7	38715.17	6.35	0.00	7	174.17	2.79	0.01
Error	154	4524.98	----	----	154	134034.12	----	----	154	1373.32	----	----
Sit*State	7	155.32	1.99	0.06	7	13005.78	4.87	0.00	7	89.62	3.35	0.00
Grp*Sit*State	7	41.20	0.53	0.81	7	4801.14	1.80	0.09	7	57.88	2.16	0.04
Error	154	1720.66	----	----	154	58736.01	----	----	154	588.37	----	----

Tukeys ($P \leq .05$)

Frequency: TF, TT > AF > AT, FF, TB, AB > FT
Duration: TT > TF > AF, AT, FF, TB, AB, FT
Mean Duration: TT > TF > AF, AT, FF, TB, AB, FT

(across groups and situations) of about 5.5 seconds (out of 180 total). In the nonhandicapped dyads, these toy situations were thus best characterized by mutual attention to the toy, with the second most common state being that in which the baby continued to attend to the toy while the mother watched his face. In the handicapped dyads, the opposite pattern was most characteristic. In both groups, these two states together generally accounted for over 80% of the interaction time.

Within these total durations, the dyads primarily alternated between TT and TF, with episodes of TT lasting longer; this was particularly apparent in dyads with nonhandicapped babies, while in dyads with handicapped babies, there was less difference in the mean durations of these two states.

Comparisons between the two groups of dyads yielded several differences in the relative occurrence of different dyadic states, with differences in AF and FF accounting for most of these. Episodes of each of these lasted longer in dyads with handicapped babies, with AF occurring more frequently in these dyads as well. A situation x group interaction was found for the frequency of episodes of TF: in the handicapped group, it occurred more often in instruction than in play, while the opposite pattern characterized the nonhandicapped dyads. Overall, dyads with handicapped babies spent significantly more time in FF and AF than did dyads with nonhandicapped babies, while the latter showed a tendency to spend relatively more time in TT (p=.08).

In comparing the two situations, it was found that state changes in general occurred less frequently, and states were shorter, in instruction than in play; these patterns were not, however, equally characteristic of all states. Three states, AF, AB and TB, each occurred significantly less frequently in instruction, with episodes of AF and AB also being significantly shorter in instruction. Further, episodes of mutual gaze (FF) tended to be shorter in instruction. Episodes of TT, in contrast, tended to be longer ($p=.06$), being totally accounted for, however, by the nonhandicapped dyads. In terms of total duration, TT accounted for significantly more time during instruction, while FF tended to account for less ($p=.08$).

Thus, at 12 months, the most common dyadic state, mutual visual attention to the toy, was even more characteristic of the instructional than of the play situation. This was, however, not accomplished to the same extent in the two groups, nor was it accomplished in the same manner. When the handicapped baby was looking at the toy (which was less than when the baby was nonhandicapped), the mother more frequently monitored his face, creating shorter episodes of TT and more frequent episodes of TF.

Twenty-four months--As at 12 months, TT and TF accounted for most of the interaction time; TT and TF again occurred about equally frequently, with episodes of TT lasting longer than episodes of TF. Again, the next most common state was AF. While these patterns were true overall, however, they again varied by group and situation.

At 24 months (as shown in Tables 17-21), only two situation differences were found in the frequencies of occurrence of particular states: TB still occurred less often in the instruction situation, and AT now occurred less often in instruction as well. Other situational differences evidenced at 12 months in AF and AB (both less frequent in instruction) had disappeared. The situation difference in the mean duration of AF (shorter in instruction) remained. Two new situation x group interactions

Table 17

Frequency of Dyadic Gaze States in Toy Situations at 24 Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Baby Look Face/ Mom look Face	5.45	7.39	3.81	4.60	2.08	4.96	0.23	0.44
Baby Look Face/ Mom look Toy	1.81	1.89	0.91	1.04	2.38	6.54	0.23	0.44
Baby Look Toy/ Mom look Face	11.09	7.90	12.36	8.64	11.08	10.10	7.00	5.96
Baby Look Toy/ Mom look Toy	10.55	8.08	11.09	8.54	12.00	6.00	9.69	4.96
Baby Look Toy/ Mom look Body	0.36	1.21	0.00	0.00	1.46	2.57	0.00	0.00
Baby Look Away/ Mom look Face	7.55	6.41	6.82	8.01	2.85	3.74	0.62	0.77
Baby Look Away/ Mom look Toy	6.55	5.37	3.64	3.70	2.85	3.67	1.00	1.00
Baby Look Away/ Mom look Body	0.18	0.40	1.00	2.41	1.15	2.23	0.00	0.00

Table 18

Duration of Dyadic Gaze States in Toy Situations at 24 Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Baby Look Face/ Mom Look Face	15.82	24.08	9.55	13.79	3.62	9.06	0.38	0.77
Baby Look Face/ Mom Look Toy	1.27	1.90	1.73	2.05	3.69	8.80	0.23	0.44
Baby Look Toy/ Mom Look Face	35.18	25.38	41.27	32.41	31.23	31.14	25.77	27.57
Baby Look Toy/ Mom Look Toy	65.09	56.15	73.73	58.26	115.31	52.25	147.92	29.76
Baby Look Toy/ Mom Look Body	1.81	3.92	0.00	0.00	4.23	7.56	0.00	0.00
Baby Look Away/ Mom Look Face	34.09	38.62	29.09	41.07	6.38	9.36	0.85	1.14
Baby Look Away/ Mom Look Toy	20.55	20.45	9.73	11.71	5.15	8.38	1.08	1.12
Baby Look Away/ Mom Look Body	0.27	0.65	3.18	9.27	4.62	9.49	0.00	0.00

Table 19

Mean Duration of Dyadic Gaze States in Toy Situations at 24 Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Baby Look Face/ Mom Look Face	1.80	1.55	1.27	1.63	0.62	0.84	0.38	0.77
Baby Look Face/ Mom Look Toy	0.45	0.69	1.08	1.32	0.95	1.33	0.23	0.44
Baby Look Toy/ Mom Look Face	2.87	1.44	3.00	1.30	2.35	1.32	2.72	2.07
Baby Look Toy/ Mom Look Toy	5.64	6.25	5.34	3.60	15.95	16.02	24.19	23.04
Baby Look Toy/ Mom Look Body	0.30	0.98	0.00	0.00	1.03	1.49	0.00	0.00
Baby Look Away/ Mom Look Face	3.17	2.56	2.12	2.34	1.05	1.11	0.65	0.90
Baby Look Away/ Mom Look Toy	2.52	2.20	1.92	1.97	1.02	1.05	0.65	0.55
Baby Look Away/ Mom Look Body	0.27	0.65	0.58	1.21	1.11	1.78	0.00	0.00

TABLE 20

Two-way ANOVA Summary Table:
Dyadic Gaze at 24 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
Baby Look Face												
Mom Look Face												
Group	1	144.52	6.03	0.02	1	1359.71	8.01	0.01	1	12.79	9.02	0.01
Error	22	527.48	----	----	22	3733.27	----	----	22	31.17	----	----
Situation	1	36.13	1.51	0.23	1	269.07	1.19	0.29	1	1.72	1.08	0.31
Sit*Group	1	0.13	0.01	0.94	1	27.57	0.12	0.73	1	0.26	0.17	0.69
Error	22	528.12	----	----	22	4959.24	----	----	22	34.99	----	----
Baby Look Face												
Mom Look Toy												
Group	1	0.82	0.06	0.81	1	2.54	0.11	0.75	1	0.37	0.34	0.57
Error	22	295.99	----	----	22	524.46	----	----	22	23.81	----	----
Situation	1	17.54	1.45	0.24	1	26.94	1.22	0.28	1	0.03	0.03	0.87
Sit*Group	1	10.54	0.87	0.36	1	45.69	2.07	0.16	1	5.34	5.44	0.03
Error	22	265.94	----	----	22	484.98	----	----	22	21.60	----	----
Baby Look Face												
Mom Look Toy												
Group	1	86.15	0.82	0.37	1	1127.55	0.89	0.36	1	1.89	0.65	0.43
Error	22	2301.83	----	----	22	27082.36	----	----	22	64.32	----	----
Situation	1	23.43	0.72	0.41	1	1.18	0.00	0.96	1	0.71	0.35	0.56
Sit*Group	1	85.26	2.60	0.12	1	397.60	0.88	0.36	1	0.18	0.09	0.77
Error	22	720.55	----	----	22	9902.07	----	----	22	45.25	----	----

Table 20 (continued)

SOURCE	DF	Frequency SS	F	PROB.	DF	Duration SS	F	PROB.	DF	Mean Duration SS	F	PROB.
Baby Look Toy												
Mom Look Toy												
Group	1	0.01	0.00	0.99	1	46113.01	11.88	0.00	1	2414.27	9.08	0.01
Error	22	1689.66	----	----	22	85410.97	----	----	22	5851.57	----	----
Situation	1	9.25	0.49	0.49	1	5069.67	4.76	0.04	1	222.71	1.19	0.29
Sit*Group	1	24.25	1.27	0.27	1	1713.00	1.61	0.22	1	254.69	1.36	0.26
Error	22	418.75	----	----	22	23449.81	----	----	22	4121.37	----	----
Baby Look Toy												
Mom Look Body												
Group	1	3.59	1.68	0.21	1	27.69	1.45	0.24	1	1.59	1.93	0.17
Error	22	46.89	----	----	22	419.97	----	----	22	18.09	----	----
Situation	1	9.92	4.66	0.04	1	87.28	4.57	0.04	1	5.20	6.33	0.02
Sit*Group	1	3.59	1.68	0.21	1	27.69	1.45	0.24	1	1.59	1.93	0.18
Error	22	46.89	----	----	22	419.97	----	----	22	18.09	----	----
Baby Look Away												
Mom Look Face												
Group	1	354.09	8.16	0.01	1	9326.34	6.51	0.02	1	38.42	7.16	0.01
Error	22	954.89	----	----	22	31519.97	----	----	22	118.10	----	----
Situation	1	26.07	2.11	0.16	1	330.86	5.47	0.03	1	6.20	5.09	0.03
Sit*Group	1	6.73	0.54	0.47	1	0.86	0.01	0.91	1	1.27	1.04	0.32
Error	22	272.24	----	----	22	1330.62	----	----	22	26.82	----	----

Table 20 (continued)

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
Baby Look Away												
Mom Look Toy												
Group	1	119.59	6.80	0.02	1	1722.01	8.04	0.01	1	22.79	6.98	0.01
Error	22	386.66	----	----	22	4713.24	----	----	22	71.85	----	----
Situation	1	67.37	6.98	0.01	1	660.97	8.55	0.01	1	2.82	1.93	0.18
Sit*Group	1	3.37	0.35	0.56	1	135.39	1.75	0.20	1	0.16	0.11	0.74
Error	22	212.30	----	----	22	1700.28	----	----	22	32.26	----	----
Baby Look Away												
Mom Look Body												
Group	1	0.00	0.00	0.98	1	4.01	0.09	0.76	1	0.20	0.17	0.69
Error	22	57.66	----	----	22	962.90	----	----	22	26.77	0.88	0.61
Situation	1	0.34	0.12	0.73	1	8.67	0.19	0.66	1	1.94	1.41	0.25
Sit*Group	1	11.59	4.13	0.05	1	168.67	3.78	0.06	1	6.02	4.38	0.05
Error	22	61.66	----	----	22	981.99	----	----	22	30.25	----	----

TABLE 21

Three-way ANOVA Summary Table: Dyadic Gaze at 24 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
Group	1	290.50	6.54	0.02	1	28.41	1.37	0.25	1	147.24	5.08	0.03
Error	22	976.99	----	----	22	456.96	----	----	22	637.50	----	----
Situation	1	167.79	5.67	0.03	1	24.03	1.20	0.29	1	2.78	0.14	0.71
Sit*Group	1	70.96	2.40	0.14	1	19.21	0.96	0.34	1	19.23	0.99	0.33
Error	22	650.69	----	----	22	441.73	----	----	22	428.40	----	----
State	7	5633.88	23.46	0.00	7	402778.86	57.31	0.00	7	6414.00	25.34	0.00
Grp*State	7	418.28	1.74	0.10	7	59654.45	8.49	0.00	7	2345.08	9.27	0.00
Error	154	5284.07	----	----	154	154630.20	----	----	154	5568.19	----	----
Sit*State	7	35.83	0.42	0.89	7	6450.87	3.32	0.00	7	236.15	1.33	0.24
Grp*Sit*State	7	74.50	0.87	0.53	7	2497.26	1.28	0.26	7	250.30	1.41	0.20
Error	154	1874.76	----	----	154	42787.24	----	----	154	3902.22	----	----

Tukeys (p .05)

Frequency:	TT, TF > AF, AT, FF, FT, AB > TB
Duration:	TT > TF > AF, AT, FF, AB, FT, TB
Mean duration:	TT > AF, AF, AT, FF, FT, AB, TB

were found: in the handicapped group, episodes of FT were longer in instruction than in play, while in the nonhandicapped group they were shorter. Episodes of AB showed a tendency toward a similar interaction (p=.06), as at 12 months. In terms of the total duration of the dyadic states, there were new situation differences in AF, in TB and in AT (all less in instruction), while situation differences in TT (more in instruction) remained. Further, the situation x group interaction for AB had become significant; in the handicapped group, it accounted for more time in the instruction situation than in play, while the opposite pattern was seen in the handicapped group.

Comparisons between the two groups of dyads at 24 months also yielded significant differences. Episodes of FF (while shorter in both groups at 24 than at 12 months) were still significantly longer in the handicapped dyads. Similarly, while episodes of AF were also somewhat shorter than at 12 months, they were still relatively longer in the handicapped dyads. The group difference in length of episodes of TF was no longer apparent. However, new group differences were found at 24 months in the length of episodes of TT (longer in nonhandicapped dyads, but little different from 12 months in handicapped dyads) and in episodes of AT (longer in handicapped dyads). The group difference in the total duration of time spent in TT (more in the nonhandicapped dyads) was even more significant at 24 than at 12 months, as was the difference in FF (more in the handicapped dyads). The group difference in AF was similar across the two ages (more in the handicapped dyads). A new group difference had also appeared in AT (more in the handicapped group).

In general, while visual inspection of the means showed that at 24 months each of the groups spent more time mutually engaged with the toys than they had at 12 months, the difference between the groups of dyads in TT had become greater. It had also become greater in two of the states in which the baby was looking away (AF and AT) and in FF. In the dyads with nonhandicapped babies, mutual engagement with the toy was even more characteristic at 24 than at 12 months; all other states had decreased or remained the same in frequency, mean duration and total duration; further, this difference was even more apparent in instruction than in play. In the dyads with handicapped babies, mutual engagement with the toy had also increased, but not to the same extent, and episodes remained similar in length. States in which the babies looked away had increased in frequency (although not in length), while FF had increased in frequency and total duration.

Conditional Relations in Dyadic Gaze. Note that while the results presented above describe characteristics and differeces in the two situations and the two groups, they do not yield information about relationships between the looking directions of the two partners. For example, the greater proportion of TT in the instructional situations might have been due either to the greater proportion of the babies' looks at the toy, to the mothers', or to both; a third possibility is that the looks of the two partners were conditionally related... that is, when one looked at the toy, the other was also more likely to be looking at the toy.

In order to explore this third possibiliy, and thus how these characteristic differences were created, conditional probabilities were computed for each cell in terms of, "if x is looking at ---, what is the probability that y will be looking at ---." These were computed separately for each dyadic state for each combination of group, situation and age. Significant probabilities would indicate predictable relationships between particular directions of looking of the two partners. Further, these conditional probabilities were looked at from two different perspectives, (a) the probabilities of a particular direction of the mother's gaze given a particular direction of looking by the baby, and (b) vice versa. In cases where *both* of these probabilities were significant, either positive or negative, it would mean that when the two occurred together, each one was occurring either more (positive) or less (negative) than expected when in combination with the other. In cases where one perspective yielded a significant result and the other did not, the meaning would indicate a one-way relationship: knowing x would help to predict y, but not vice versa. Where *no* significant relationship was found, neither partner's direction of gaze would be predictable from the other's; instead, that particular dyadic combination was occurring in proportion to the overall amount of looking in those particular directions by one or both of the partners individually.

Highly predictable relationships were found between directions of looking of the two partners: overall, the two members of the dyads looked in the same direction significantly more than would be expected from the overall proportions of their looks in different directions. In addition, relationships between many other combinations of directions were highly predictable. There were, however, no combinations (states) which consistently occurred together (or did not occur together) more (or less) than expected across situations, groups and age levels combined. Instead, variations were apparent between situations, groups and ages. All significant results are at $p \leq .05$.

Twelve months--In the play situation at 12 months, and in both groups of dyads, the combinations F/F, T/F and A/B predictably occurred together more than would be expected, while F/T, T/B and A/T consistently and predictably occurred together less than expected. In the handicapped dyads, the combination A/F also occurred together more than expected, while in the nonhandicapped dyads it did not. In both sets of dyads, the combination T/A yielded a negative 1-way relationship: the mother looked away less than usual when the babies looked at the toys. However, when the mothers were looking away, the babies' direction of looking was no more predictable than its overall occurrence. In the handicapped dyads, the combination T/F occurred together less than expected from either the babies' looking at the toy or the mother's looking at their babies faces. In the nonhandicapped dyads the relationship was one way; when the mothers in the nonhandicapped group looked at their babies' faces, their babies were less likely than usual to be looking at the toys; however, when the babies looked at the toys, the mothers looks were distributed as usual. Conversely, in the nonhandicapped dyads, the combination A/A occurred together more than expected: each partner's "away" was predictable from the other's. In the handicapped dyads, when the mothers looked away, their babies were also looking away, but not vice versa.

Thus, in Situation 2, when either group of babies was looking at their mothers' faces, their mothers were more likely than usual to be looking at them as well, and less likely than usual to be looking at the toy. Conversely, when their mothers were looking at their babies the babies were more likely than usual to also be looking at them and less likely than usual to be oriented to the toys; in addition, if the dyads were in the handicapped group, the babies were also more likely than usual to be looking away. Similarly, when babies were looking at the toys, their mothers were more likely to also be looking at the toys, and less likely than usual to be looking at their babies' bodies; mothers of the handicapped babies were also less likely than usual to be watching their babies' faces. On the other hand, when their moms were looking at the toys, babies in both groups were less likely to be looking at their mothers or away, and most likely to also be looking at the toys. Finally, when babies in either group were looking away, their moms were less likely to be looking at the toys and more likley to be watching their bodies (i.e., the backs of their heads); when the babies were handicapped, their moms were also more likley to be watching their faces, while moms of nonhandicapped babies were, like their babies, more likely to be looking away. Conversely, when moms were looking away, their babies were very unlikely to be looking at the toys, and also likely to be looking away.

In Situation 4 (instruction), the F/F combination occurred together more than expected in the nonhandicapped group but not in the handicapped group (i.e., in the handicapped group, "look at face" of neither partner could be reliably predicted from "look at face" in the other). In both groups, A/B predictably occurred together, while in the handicapped group, the combinations A/A, A/F, F/A, and T/T also occurred together more than expected. Also in the handicapped, but not in the nonhandicapped group, the combinations T/F, T/A and A/T occurred together less than expected.

Several of the combinations also showed one-way relationships. In both groups, probabilities for the F/T combination showed that when the babies were looking at their mothers, their mothers were very unlikely to be looking at the toys. Mothers' looks at the toys, however, did not help in predicting whether the babies' would be looking at their faces. In both groups, the T/B combination showed a similar pattern: when the mothers were looking at their babies' bodies, their babies were very unlikely to be looking at the toys, but mothers' looks at their babies' bodies were not predictable (one way or the other) from their babies' looks at the toys. The T/T combination, which occurred together more than expected in the handicapped group, yielded a one-way pattern in the nonhandicapped group: when the mothers were looking at the toys, their babies were likely to be looking at them, too; when the babies were looking at the toys, their mothers' directions were no more predictable than usual.

Thus, in Situation 4 at 12 months, when babies were looking at their mothers, their mothers were less likely than usual to be looking at the toy. Mothers of nonhandicapped babies were also more likley to be watching their babies. In mothers of the handicapped babies, however, this only approached significance, while, unexpectedly, they were also more likely to be looking away. The results were also unexpected when examined from the other direction: when nonhandicapped babies looked at their moms, their moms were most likely to be looking at them; when handicapped babies looked at their moms, their moms were less than likely to be looking at the toy, and were looking away more than usual.

Group differences were also found in relation to the babies' looks at the toys: when the babies were handicapped, their mothers also looked at the toys more than usual, and looked at their babies' faces and away less than usual, as in Situation 2. When the babies were in the nonhandicapped group, none of their looks were more predictable than the unconditional probabilities would indicate. Conversely, when their moms were looking at the toys, the babies were more than likely to be doing so, too, and the handicapped babies were also less likely to be looking away.

Looking away in the babies, in both groups, was related to their mothers' watching their bodies more than usual; in the handicapped group, when babies were looking away, their mothers were also more likely than would be expected to be looking away or at their faces, and less likely to be looking at the toys. When mothers of nonhandicapped babies looked away, their babies were less likely to be looking at the toy, and more likely to be looking away, too, or at their mothers' faces (as noted above). When mothers of handicapped babies looked away, their babies' looks matched what was expected from their unconditional probabilities. In both groups, when mothers were looking at their babies' bodies, the babies were very likely to be looking away and very unlikely to be looking at the toys.

Twenty-four months--At 24 months, contingent probabilities showed even more differential patterns of relationships for the two groups, especially across situations. In the play situation, in the dyads with nonhandicapped babies, results were identical to those at 12 months, with one new addition: the combination F/B occurred together significantly less than expected from the overall occurrences of either. These dyads thus had changed very little in terms of the conditional relationships in their directions of gaze in the play situations. In the dyads with handicapped babies, play contained more changes between the two age levels. The combination A/B no longer reliably occurred together, while the negative relationship in the T/A combination was now predictable from each direction. T/B, conversely, was now predictable from only one direction: mothers were very unlikely to be looking at their babies' bodies when their babies were looking at the toys. A new one-way relationship had also appeared in F/A: mothers were highly unlikely to be looking away when their babies were watching their faces, but whether or not the mother was looking away did not predict whether the babies would be looking at their faces.

In the instruction situation, differences between ages (and even more than in play) were apparent in both groups. In the dyads with handicapped babies, there were no longer any combinations which were predictable from only one direction. Two more combinations (in comparison to 12 months) now occurred together significantly more than expected: these were F/F and A/B. One new combination (A/T), reliably occurred together less than expected. Two combinations, however, no longer differed from overall occurrence: these were F/A and T/A. Two other combinations had changed from being predictable from only one direction to being predictable from both: the combinations F/T and T/B now occurred together less than expected.

In contrast to the handicapped dyads, in which no combinations showed a one-way relationship in the instructional situation, in the non-handicapped dyads all but two of the significant combinations were now one-way. Only F/F and A/F reliably occurred together significantly more than expected. Of the combinations for which one-way influences were found, three were combinations in which the babies were looking at the toys. When mothers were looking at their babies faces or away, their babies were very unlikely to be looking at the toys, and when the mothers were looking at the toys, their babies were more than likely to be doing so as well. However, when the babies were looking at the toys, none of these three directions of the mothers' looks were any more predictable than expected. Two other combinations with one-way relationships (F/T and A/T) were those in which the mother looked at the toy. When babies were looking at their mothers or away, their mothers were very unlikely to be looking at the toys. However, when the babies were looking at their mothers faces or away, their mothers' looks at the toys were no more predictable than their overall occurrence.

Transitions between Dyadic Gaze States at 12 Months

This section represents a slight departure from those just preceeding in that (a) the analysis covers only the 12 month age level, and (b) the data for the dyad containing a blind baby have been removed. These results are included in this section on gaze because they not only represent extensions in the analyses which will later be replicated with other data, but also add yet another piece to the puzzle of understanding the structure and functions of gaze in these groups and situations.

To gain a more dynamic picture of the actual flow of the interaction from one dyadic event to the next, dyadic gaze states were analyzed using event sequential analysis (to 2 lags), yielding information on whether transitions between particular states occurred more or less frequently than would be expected from the frequency of the overall occurrence of the particular states. All 12 states were included in this analysis; while some seldom occurred, they have obvious theoretical importance for examining the sequence of states.

Z-scores were used to determine whether the actual occurrence of each 1-step and 2-step transition differed from what would be expected. A significant z-score would indicate that a certain transition between states has a higher (or lower) probability of occurring (or of not occurring) in a particular sequence than events which are not "connected" in any way.

From the results already presented, it is clear that in situations involving toys, babies rarely looked at anything else, while their mothers looked back and forth between the toys and their babies' faces, resulting in the two dyadic states which were most characteristic of toy play situations. What the sequence of dyadic states can add to this is information concerning the order in which different states are likely to occur in different situations and groups.

In each of the two toy situations (play and instruction), and in each group, the transition TT → TF occurred significantly more often than expected ($p=\bar{<}.05$); when baby and mother were both looking at the toy, the next probable event was for the mother to create a new state (TF) by looking at the baby as the baby continued to look at the toy. (Note that TF is in general a high probability event; in this case, the analysis indicates that its occurrence is even more probable [significantly] following a TT). In the play situation, this was the only transition which was similarly predictable in each of the two groups, and was the only transition that occurred more than expected in the dyads wth handicapped babies. In the dyads wth nonhandicapped babies, additional transitions indicated far more predictability than found in this one-step sequence alone: in these dyads, the return step from TF→TT occurred significantly more than expected as well. Further, given a TT, the dyads were likely to return to TT at lag 2 (i.e., skipping an event). Similarly, given a TF, the dyads were likely at lag 2 to return to TF. These probabilities suggest an alterating cycle in which the baby is engaged with the toy while the mother looks back and forth between the toy and the baby's face (with TT lasting larger than TF, as discussed above). Negative scores at lag 2 for the transitions TT → TF and TF → TT also indicate that dyads were very unlikely to go from one to the other unless they went directly (i.e., at lag 1). That is, these 2-event transitions happened less than expected from the overall occurrence of the states. (These significant negative transitions at lag 2 are probably partially due to the fact that intervening states would involve one or more simultaneous changes in mother and baby (e.g., from TT→AA), rather than a change in only one member (e.g., from TT→TA).

In instruction, there was more similarity between the two groups: cycling between TT and TF was found in the dyads with handicapped babies as well. That is, when the mother was "teaching," the dyads with handicapped babies resembled those with nonhandicapped babies, with very predictable state cycles. In the dyads with nonhandicapped babies, the cycles tended to be even more predictable (to have a higher probability of occurrence) in instruction than in play.

None of the state sequences involving states other than TT or TF happened significantly more or less than was expected from their overall occurrences.

Defining Leader-Follower Sequences in Dyadic Gaze States at 12 Months

The following sets of analyses are each related to exploring the roles of mothers and babies in terms of their leadership in toy interactions, and how these vary across groups and situations. The data sets used in these analyses also differ from those in most of the previous sections in that the data for the blind baby have been removed, just as it was for the lag analysis of baby gaze at 12 months.

One of the major research issues proposed for examination in the original proposal for this project was that of the roles of mother and baby during dyadic interaction. While the previous sections have given many clues to those roles, this section will address the issue more directly. In the present analysis, two roles were chosen for examination, that of leader and that of follower. Each of the possible transitions between any two dyadic states was categorized into one of the following eight groups: (a) baby lead social (e.g., AA→FA); (b) mother lead social (e.g., AA→AF); (c) baby lead toy (e.g., FF→TF), (d) mother lead toy (e.g., FF→FT); (e) baby follow social (AF→FF), (f) mother follow social (e.g., FA→FF); (g) baby follow toy (e.g., AT→TT), and (h) mother follow toy (e.g., TA→TT). Transitions which did not logically fall into one of these categories were excluded from the present analyses. Frequencies of occurrence of transitions in each of these categories were converted into proportions so that the overall differences in numbers of events would not influence the analysis; these proportions were then subjected to a factorial mixed design analysis of variance with repeated measures on two factors. A separate ANOVA was used on each of the following: (a) leadership in the handicapped dyads; (b) leadership in the nonhandicapped dyads; (c) following in the handicapped dyads, and (d) following in the nonhandicapped dyads. Factors in each analysis included partner (mom/baby), situation (play/instruction) and type of transition (social/toy). The latter two factors were those treated as repeated measures. Results appear in Tables 22-24.

The Leadership Role. Leadership was defined as a combination of all transitions in which one partner initiated a new focus of attention; these were further subdivided into transitions in which the new focus was social (for mom: TT → TF, TB → TF, AT → TF, AB → TF, AA → AF, TA → TF; for baby: TT → FT, AT → FT, TB → FB, AB → FB, TA → FA, AA → FA), and transitions in which the new focus was the toy (for mom: FF → FT, FB → FT, AF → AT, AB → AT, AA → AT, FA → FT; for baby: FF → TF, AF → TF, FB → TB, AB → TB, AA → TA, FA → TA).

TABLE 22

Means and Standard Deviations for Leader and Follower Transitions in Toy Play and Instruction

PLAY SITUATION

Nonhandicapped (n = 13)

	Lead				Follow			
	Social		Toy		Social		Toy	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
Baby	1.20	1.58	6.97	6.04	1.09	1.34	3.21	2.97
Mom	22.98	11.98	2.83	2.72	.73	1.69	19.28	11.64

Handicapped (n = 10)

	Lead				Follow			
	Social		Toy		Social		Toy	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
Baby	1.69	1.69	11.71	6.31	2.23	2.78	5.11	5.62
Mom	17.05	6.13	5.28	4.43	1.71	1.52	13.19	8.82

INSTRUCTION SITUATION

Nonhandicapped

	Lead				Follow			
	Social		Toy		Social		Toy	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
Baby	.38	.94	1.14	1.96	.00	.00	4.35	7.51
Mom	34.95	9.78	.31	1.11	.15	.54	35.85	10.80

Handicapped

	Lead				Follow			
	Social		Toy		Social		Toy	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
Baby	.49	1.04	9.97	8.02	1.37	1.64	2.98	5.97
Mom	27.38	12.87	3.41	3.63	.48	1.51	23.47	13.04

TABLE 23

Leadership by Babies and Mothers in Toy Play and Instruction

Dyads with Nonhandicapped Babies					Dyads with Handicapped Babies				
Source	DF	SS	F	Prob.	Source	DF	SS	F	Prob.
Who	1	4289.20	91.68	0.00	Who	1	1065.22	16.61	0.00
Error	24	1122.77	-	-	Error	18	1154.49	-	-
Type	1	3785.76	81.55	0.00	Type	1	327.89	6.01	0.02
Type*Who	1	6111.00	131.64	0.00	Type*Who	1	3807.42	69.73	0.00
Error	24	1114.09	-	-	Error	18	982.79	-	-
Situation	1	12.65	0.52	0.48	Situation	1	37.40	1.99	0.18
Who*Situation	1	421.18	17.30	0.00	Who*Situation	1	160.97	8.57	0.01
Error	24	584.33	-	-	Error	18	338.07	-	-
Type*Situation	1	616.98	21.87	0.00	Type*Situation	1	200.98	5.83	0.03
Who*Type*Situation	1	146.16	5.18	0.03	Who*Type*Situation	1	168.26	4.88	0.04
Error	24	677.06	-	-	Error	18	620.31	-	-

TABLE 24

Following by Babies and Mothers in Toy Play and Instruction

Dyads with Nonhandicapped Babies					Dyads with Handicapped Babies				
Source	DF	SS	F	Prob.	Source	DF	SS	F	Prob.
Who	1	3645.77	83.59	0.00	Who	1	922.22	15.76	0.00
Error	24	1046.71	-	-	Error	18	1053.43	-	-
Type	1	5990.64	140.78	0.00	Type	1	1897.35	27.18	0.00
Type*Who	1	3711.43	87.22	0.00	Type*Who	1	1123.50	16.10	0.00
Error	24	1021.27	-	-	Error	18	1256.38	-	-
Situation	1	418.08	12.73	0.00	Situation	1	45.81	2.46	0.13
Who*Situation	1	413.12	12.58	0.00	Who*Situation	1	181.02	9.74	0.01
Error	24	788.22	-	-	Error	18	334.70	-	-
Type*Situation	1	610.81	14.48	0.00	Type*Situation	1	131.58	7.27	0.01
Who*Type*Situation	1	361.59	8.57	0.01	Who*Type*Situation	1	204.16	11.29	0.00
Error	24	1021.13	-	-	Error	18	325.60	-	-

Of the total number of leadershp transitions, significantly more were of a social nature rather than being a change toward the toy. In each group, this preponderance of social leads was accounted for by the mothers, since in each group of dyads, babies initiated more toy leads than did the mothers. While there was no difference between situations in the overall proportion of leadership transitions, the differences between the proportion of social and toy leads was greater in instruction than in play, as was the difference between mothers and babies. Each of these was accounted for by proportionately more of the leads in the instruction situation being social leads by the mother, while other combinations (in particular baby toy leads) were proportionately smaller. Thus, given a leadership transition, it was usually of a social nature, and was usually initiated by the mother; this was even more characteristic of the instruction situation. However, when the transition involved a change in attention toward the toy, it was usually the baby who led.

Although no statistical comparisons were made between groups, a visual analysis of the means indicated that the proportion of transitions defined by "leads" was about the same in each group and in each situation. Each situation did, however, seem to influence each group of dyads somewhat differentially. In both play and instruction, but partcularly in play, the difference in the proportion of leadership transitions accounted for by mothers and babies in the handicapped was not as great as in the nonhandicapped group. Further, the difference in the type of leadership characteristic of each partner was not as great; out of their total leads, mothers of handicapped babies engaged in proportionately more toy leads and proportionately fewer social leads. Again, this was more characteristic of play than of instruction.

Following the Other's Lead. Transitions defined as "follows" included all of those in which one partner followed the direction of gaze of the other. As in leadership, these were subdivided into social (for mom: FT → FF, FB → FF, FA → FF; for baby: AF → FF, TA → AA) and toy follows (for mom: TF → TT, TB → TT, TA → TT; for baby: FT → TT, AT → TT).

Of the total proportion of follower transitions, those involving toys occurred significantly more than those of a social nature. While this was true for both mothers and babies, it was the mothers, not the babies, who accounted for most of the difference. As in the analysis of leadership, results were even more characteristic of the instruction situation than of play, with proportionately more of the following being toward the toy and being accounted for by the mothers. Unlike the leadership transitions, which were similar in proportion in the two situations, slightly more follower transitions occurred in instruction than in play.

A visual analysis of the means again showed some interesting differences in roles in the two groups. In each situation, there was more difference between the proportions of follows accounted for by mothers and babies in the dyads wth nonhandicapped babies. The difference between toy and social follows was also greater in the nonhandicapped dyads, and particularly so in the instruction situation.

Summary. Overall, it was the mothers who assumed both the leader and the follower roles, at least as defined by changes in visual attention. However, leadership transitions were predominantly social, while follower transitions were related to the toy. It is quite clear that mutual involvement was up to the mothers, for these results closely parallel those reported earlier for directions of the babies' gaze in general. The babies simply remained involved with the toys: hence the large proportion of mother follows in that direction and the large proportion of mother social leads. The mothers' direction of gaze seems to have had little impact on the babies, suggesting that at this age, if the mother is exerting any leadership, it is not in the form of changes in gaze direction. If either member can be said to lead through gaze direction, it is the baby.

Differences between situations, between mothers and babies, and between the types of leading or following, all seem to reflect differences reported earlier for the babies. When the baby is visually oriented to the toy for longer periods of time (nonhandicapped babies; instruction situation), then, as the mother checks back and forth, her leader and follower patterns would naturally fall into the patterns reflected here. Results also support our earlier conclusion that in the dyads with handicapped babies, the babies' patterns of gaze did not offer as much guidance for the mothers in defining their own roles. While roles were not as clearcut between mothers and handicapped babies in either situation, they were more differentiated in the instruction than in the play situation. This again supports earlier speculations that the instruction situation may not be as difficult for the mothers, either because their babies are more focused on the toys and/or because their own intent governs their behavior to a greater extent.

Summary of Patterns of Gaze

These babies spent most of their time engrossed in the toy. When they did change their direction of gaze, it was usually toward the toy and was likely to remain there. In general, brief looks at their mothers and away were interspersed within ongoing visual attention to the objects with which they were engaged. It seems clear that regardless of group or situation, if any social interaction is to occur, it must be integrated with this interest in objects. However, these analyses indicate that the babies' patterns of gaze probably do not support this integration of roles in the same way in play and instructional situations. In the instructional situation, the babies looked relatively longer at the toy, and took fewer and shorter looks away at their mothers. Looks away were also less frequent in the instructional situation. The instructional situation was thus characterized by more visual attention to the toy, and less attention to other elements of the environment, than was play. These differences were, however, not equally characteristic of the two groups; despite the range of handicapping conditions, consistent differences were found between the handicapped and the nonhandicapped babies. The handicapped babies had shorter episodes of looking at the toy and longer episodes of looking at their mothers, and in general changed their direction of gaze more frequently.

At 12 months, there was also a tendency for the nonhandicapped babies to differ more across the two situations than did the handicapped babies; thus, while the situational differences in each group were qualitatively similar, the groups were affected to different degrees. The handicapped babies were generally more similar in the two situations than were the nonhandicapped babies.

At 24 months, as compared to 12, there were even more difference between the babies: the nonhandicapped babies took fewer and shorter looks away, while the handicapped babies looked away and at their mothers more frequently, with longer looks away and shorter looks at the toy. Overall, they looked less at the toys than at 12 months.

The mothers, like their babies, also looked most at the toys. The groups differed, however, in the extent to which this was so: in mothers of the handicapped babies, there was less difference between amounts of looking at the toys and at their babies, and between amounts of looking at the toys and away. In general, mothers looked back and forth between their babies and the toys fairly equally, regardless of the situation. While in both groups looks at the toys lasted longer than looks at their babies, the mothers of the handicapped babies took relatively more frequent looks in each of these directions, relatively longer looks at their babies, and relatively shorter looks at the toys: these patterns were most apparent in the instruction situation. Differences in the mother of the nonhandicapped babies when their babies were 24 as compared to 12 months tended to match the differences in their babies, with more and longer episodes of toy orientation and fewer episodes of looking at their babies. This change was not completely matched by mothers of the handicapped babies: while their babies at 24 months looked less at the toy, their mothers looked slightly more at the toy than they had at 12 months. This meant, however, that looking at the toy was more similar in occurrence for mothers and their handicapped babies than it had been at 12 months. Overall, in the nonhandicapped dyads, differences in the mothers across situations at both ages also tended to match those in their babies while those in the handicapped dyads did so only in total duration. In this group, even though in instruction the babies changed direction less frequently and remained attentive to the toy for longer periods than in play, their mothers looked back and forth even more frequently than in play, with somewhat shorter durations in each direction, and with more similar mean durations of looking at the toy and the babies' faces.

Dyads were best characterized by mutual orientation to the toy, with the second most common state being that in which the babies were oriented to the toy while the mother watched the babies' faces; in dyads with handicapped babies at 12 months, however, the scale was tipped slightly in the opposite direction. While TT and TF occurred about equally frequently, the difference between the length of episodes of TT and TF, and the total amount of time spent in these two states, differed proportionately for the two groups of dyads at both ages and in each situation. Mutual orientation to the toy was more characteristic of the nonhandicapped dyads, while dyads with handicapped babies were characterized by more equal amounts of TT and TF, and more of the states in which babies looked away. While mutual gaze was rare, it was also more common in dyads with handicapped babies.

Overall, across ages, situations and groups, the amount of time spent in mutual orientation to the toy was closely related to the amount of time that the mothers spent looking at the toy: when the mothers looked at the toys, the babies were already there, and mutual orientation was the result. Further, the amount of time spent in mutual gaze was closely related to the babies' looking at their mothers' faces: when the babies looked, the mothers were also looking at them. These relationships were, however, less clear in the handicapped group. The more equal amounts of TT and TF in the handicapped group were related to the mothers' not matching (except in total duration) differences in their babies' looking at the toys in different situations and at different ages. The higher occurrence of TT in the instructional situation was due both to the fact that each partner looked at the toy more in instruction, and to the positive conditional relationship between the two. The lower occurrence of TF in instruction in the nonhandicapped group seems to be primarily related to differences in the mothers' looks at the babies' face (less in instruction); the same factor may therefore best explain the higher occurrence of TF in instruction in the handicapped group, although the babies also looked at the toys more in instruction. The decreases in all other states in Situation 4 seem to be related to situation differences in each partner of the overall occurrence of looking away and at the other's face. Similarly, some of the changes across ages seem to be related to changes in the unconditional probabilities of directions of looking of one of the partners (e.g., an increase in TT and AT related to increases in the moms looking at the toy, and a decrease in TF related to slight decreases in the duration of the babies' looks at the toys).

In the play situation at both age levels, it was more likely than expected that when one partner was looking at the toy, the other one was, too. Similar relationships were found for mutual gaze, and between the baby's looks away and some form of "monitoring" (looking away or at the baby's body or face). Mutual gaze and the "away/monitor" combination were also more likely than would be expected in Situation 4. However, only in the handicapped group did mutual orientation to the toy occur more than expected. At both ages, although the mothers did not look at the toys unless their babies were, they did not necessarily look at them more than expected when their babies were looking at them. In general, when the mothers of the nonhandicapped babies were "teaching," the proportion of looks which they took in each direction did not differ from their overall proportions..

One particular combination, FA, yielded particularly intriguing conditional probabilities in the handicapped dyads in the instruction situation at

12 months. While it occurred only 7 times and for a total duration of 8 seconds, the combination occurred together more than expected. Moreover, the relationship was two way. When the handicapped babies looked at their mothers' faces, their mothers were more likely to be looking away than usual, and when the mothers looked away, their babies were more likely than usual to be looking at their faces.

Overall, there were more conditionally significant relationships in the handicapped than in the nonhandicapped dyads, and more in play than in instruction. Further, in the handicapped dyads, more of the relationships tended to be two-way, while in the nonhandicapped dyads more tended to be one-way. This was especially so in Situation 4 at 24 months of age. Overall, these patterns of relationships indicate that in Situation 2, interactions were based more on interpersonal regulation than in Situation 4, in which at least part of the regulation probably came from the mother's intent. These patterns also indicate that at 24 months, particularly in the nonhandicapped group, more independence between partners is possible. For dyads with handicapped babies, however, this independence may be harder to achieve, explaining why more interpersonal regulation is evident in this group overall. The mothers' closer monitoring of the handicapped babies' faces, and the greater dependency between the babies' looks at the toys and the mothers' directions of gaze, illustrate that mothers' of the handicapped babies may not feel as free to let their own behavior be independent of their babies' in either situation or at either age level.

Some of the conditional relationships found in the handicapped dyads are particularly intriguing. For example, why would 12 month old handicapped babies be more likely to be looking at their moms when their moms are looking away, and vice versa? Why the differences in the types of monitoring used when the babies look away? Context analysis will be needed to address these questions.

Section 2:

Characteristics of Vocalization in Toy Situations

The concern in the present analyses was to examine another of the major communicative modalities (perhaps the major one as the baby becomes more verbal) in terms of its characteristics in play and instruction, and in the two groups of dyads. Like gaze, patterns of vocalization may directly affect the quality of different kinds of interactions. This discussion will follow the same outline as that used in the discussion of patterns of gaze, except that no sequential analyses have yet been performed on vocalization.

Baby Vocalization

Twelve Months. Three mutually exclusive codes, accounting for a minimum of 179 seconds out of 180 in each situation and group, were used in these analyses, and included Vocalization (talk), Fuss and Silent. Extremely positive and negative vocalizations were excluded because of their low occurrence. Tables 25 and 26 show that, in the two toy situations used in this study, babies were quiet significantly more than they vocalized, and vocalized more than they fussed. Silence and vocalizing each occurred more frequently than fussing, and episodes of quiet lasted significantly longer than episodes of vocalizing or fussing.

No situation differences (at $p\bar{<}.05$) were found for any of the three measures of any of the three codes. Further, of the three codes, "fuss" was the only one showing any difference between groups. Nonhandicapped babies had a larger mean duration of fussing than did handicapped babies.

TABLE 25

Two-way ANOVA Summary Table:
Baby Vocalization at 12 Months

		Frequency				Duration				Mean Duration		
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
BABY TALK												
Group	1	46.84	0.88	0.36	1	61.55	0.15	0.70	1	1.49	1.98	0.17
Error	22	1165.48	----	----	22	9083.36	----	----	22	16.64	----	----
Situation	1	85.71	2.97	0.10	1	611.06	2.39	0.14	1	1.02	1.50	0.23
Sit*Group	1	5.54	0.19	0.67	1	0.06	0.00	0.99	1	0.03	0.04	0.85
Error	22	634.27	----	----	22	5628.61	----	----	22	14.89	----	----
BABY SILENT												
Group	1	47.67	1.01	0.33	1	96.30	0.24	0.63	1	2067.20	0.93	0.34
Error	22	1037.00	----	----	22	8964.52	----	----	22	48790.49	----	----
Situation	1	55.64	1.85	0.19	1	502.40	1.77	0.20	1	1587.92	1.69	0.21
Sit*Group	1	10.31	0.34	0.56	1	23.90	0.08	0.77	1	599.36	0.64	0.43
Error	22	662.61	----	----	22	6229.92	----	----	22	20654.03	----	----
BABY FUSS												
Group	1	2.81	3.72	0.07	1	19.09	3.51	0.07	1	6.73	5.04	0.04
Error	22	16.66	----	----	22	119.83	----	----	22	29.35	----	----
Situation	1	1.31	2.28	0.14	1	9.25	2.52	0.13	1	1.60	1.32	0.26
Sit*Group	1	3.15	5.47	0.03	1	24.25	6.61	0.02	1	4.87	4.01	0.06
Error	22	12.66	----	----	22	80.75	----	----	22	26.76	----	----

TABLE 26

Three-way ANOVA Summary Table:
Baby Vocalization at 12 Months

SOURCE	DF	Frequency SS	F	PROB.	DF	Duration SS	F	PROB.	DF	Mean Duration SS	F	PROB.
Group	1	79.32	1.22	0.28	1	1.92	2.01	0.17	1	648.12	0.90	0.35
Error	22	1425.43	----	----	22	21.07	----	----	22	15880.93	----	----
Situation	1	75.75	1.85	1.19	1	1.28	1.11	0.30	1	547.24	1.82	0.19
Sit*Group	1	17.95	0.44	0.51	1	0.01	0.01	0.91	1	167.78	0.56	0.46
Error	22	899.27	----	----	22	25.31	----	----	22	6599.73	----	----
Vocalization	2	2152.17	59.65	0.00	2	692818.45	839.94	0.00	2	37979.10	25.35	0.00
Grp*Vocalization	2	18.00	0.50	0.61	2	175.02	0.21	0.81	2	1427.29	0.95	0.39
Error	44	793.71	----	----	44	18146.64	----	----	44	32955.54	----	----
Sit*Vocalization	2	61.85	3.32	0.05	2	1122.53	2.07	0.14	2	1054.36	1.65	0.20
Grp*Sit*Vocalization	2	1.04	0.06	0.95	2	48.19	0.09	0.92	2	436.48	0.68	0.51
Error	44	410.28	----	----	44	11913.96	----	----	44	14095.94	----	----

Tukeys ($p \leq .05$)

Frequency:	Silence, Talk > Fuss
Duration:	Silence > Talk, Fuss
Mean Duration:	Silence > Talk, Fuss

Group x situation interactions for fussing showed that handicapped babies had slightly more frequent episodes of fussing in the play situation, while nonhandicapped babies fussed more frequently in instruction. Total duration showed a similar interaction; in play, the overall amount of fussing in the two groups was similar while in instruction nonhandicapped babies fussed more than in play and handicapped babies fussed less. In general, however, very little fussing occurred. Instead, short episodes of vocalizing (mean length of < 3 seconds) were interspersed with larger episodes of silence.

Twenty-four Months. At 24 months (Tables 27 and 28), differences between codes were identical to those found at 12 months, and again there were no differences between groups. The situation x group interactions for fussing were no longer apparent. However, a number of situation differences had appeared: vocalizing occurred less frequently, was shorter, and took up less of the total time during instruction than during play. In conjunction with this, silences also occurred less frequently, lasted longer, and accounted for more time in instruction than in play.

Visual analysis of the means at 12 and 24 months showed that age effects were similar in the two groups: at 24 months, talk and quiet were more frequent than at 12 months. However, episodes of quiet were shorter, while episodes of talk remained about the same length. Overall, there was more talk and less silence in both groups at 24 than at 12 months.

Mothers' Vocalization

Twelve Months. Codes included in the present analyses were Talk and Silent. Extremely positive and negative vocalization were excluded, as they accounted for an average of less than 1 second of the interactions.

TABLE 27

Two-way ANOVA Summary Table:
Baby Vocalization at 24 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
Baby Talk Positive												
Group	1	106.00	1.33	0.26	1	148.91	0.16	0.70	1	0.40	0.69	0.42
Error	22	1759.58	----	----	22	21091.90	----	----	22	12.68	----	----
Situation	1	224.37	7.49	0.01	1	2829.49	6.16	0.02	1	1.23	7.10	0.01
Sit*Group	1	70.37	2.35	0.14	1	517.66	1.13	0.30	1	0.00	0.02	0.89
Error	22	658.61	----	----	22	10099.81	----	----	22	3.80	----	----
Baby Silent												
Group	1	147.44	2.47	0.13	1	486.89	0.43	0.52	1	337.95	1.24	0.28
Error	22	1314.48	----	----	22	24067.36	----	----	22	6004.23	----	----
Situation	1	158.18	7.32	0.01	1	3529.44	6.77	0.02	1	305.27	5.74	0.03
Sit*Group	1	61.93	2.86	0.10	1	1071.52	2.05	0.17	1	34.82	0.66	0.43
Error	22	475.73	----	----	22	11477.48	----	----	22	1169.07	----	----
Baby Fuss												
Group	1	11.26	0.73	0.40	1	158.49	0.71	0.41	1	1.53	1.08	0.31
Error	22	339.66	----	----	22	4922.99	----	----	22	31.32	----	----
Situation	1	0.49	0.17	0.69	1	38.64	0.45	0.51	1	0.24	0.67	0.42
Sit*Group	1	3.82	1.31	0.27	1	99.64	1.15	0.30	1	0.21	0.58	0.46
Error	22	64.43	----	----	22	1908.84	----	----	22	7.84	----	----

TABLE 28

Three-way ANOVA Summary Table:
Baby Vocalization at 24 Months

SOURCE	Frequency DF	Frequency SS	Frequency F	Frequency PROB.	Duration DF	Duration SS	Duration F	Duration PROB.	Mean Duration DF	Mean Duration SS	Mean Duration F	Mean Duration PROB.
Group	1	221.77	2.32	0.14	1	3.28	1.84	0.19	1	105.30	1.23	0.28
Error	22	2098.89	----	----	22	39.27	----	----	22	1882.40	----	----
Situation	1	273.53	8.30	0.01	1	2.06			1	92.76	5.75	0.03
Sit*Group	1	110.58	3.36	0.08	1	0.00			1	10.11	0.63	0.44
Error	22	724.69	----	----	22	0.00	----	----	22	355.05	----	----
Vocalization	2	6216.21	104.02	0.00	2	466641.44	205.15	0.00	2	4950.00	26.14	0.00
Grp*Vocalization	2	42.93	0.72	0.49	2	773.00	0.34	0.71	2	234.57	1.24	0.30
Error	44	1314.72	----	----	44	50042.99	----	----	44	4165.83	----	----
Sit*Vocalization	2	116.91	5.43	0.01	2	6397.58	5.99	0.00	2	212.05	5.65	0.01
Grp*Sit*Vocalization	2	25.55	1.19	0.32	2	1688.83	1.58	0.22	2	24.92	0.66	0.52
Error	44	474.08	----	----	44	23486.13	----	----	44	825.65	----	----

Tukeys ($p \leq .05$)

Frequency:	Silent, Talk > Fuss
Duration:	Silent > Talk, Fuss
Mean Duration:	Silent > Talk, Fuss

Results for the mothers (Tables 29 and 30) showed that episodes of talk were more frequent than episodes of silence (the difference was slight, and the slack was taken up by a combination of low frequency codes). Overall, episodes of talk tended to last longer than episodes of silence (p=.06) and talking accounted for more time than silence. However, interactions between group and code and between situation and code for each measure indicated that these overall patterns of talk and silence varied according to which group or situation the mothers were in.

Group differences indicated that mothers of the nonhandicapped babies alternated more frequently between talk and silence, with somewhat longer episodes of silence, while mothers of the handicapped babies had longer episodes of talking. Overall, mothers of handicapped babies talked for more of the interaction, while mothers of nonhandicapped babies were silent for more of the interaction time; the mothers of the handicapped babies thus accounted for there being more talk than silence overall.

Situation comparisons for each measure on each code showed that only the mean duration of talking differed in the two situations (larger in instruction); this was accounted for by the mothers of the handicapped babies, as reflected in the significant interaction between group and situation for that code. Situation differences in the total durations of talk and silence also approached significance, with more talk (p=.08) and less silence (p=.07) in instruction than in play; this was again accounted for by mothers of the handicapped babies.

Twenty-four Months. By 24 months (Tables 31 and 32) only the difference in the frequency of the two codes was significant, with talk occurring more often than silence. (Again, the slack was taken up by a combination of low frequency codes.) Talk and silence no longer differed

TABLE 29

Two-way ANOVA Summary Table:
Mother Vocalization at 12 Months

		Frequency				Duration				Mean Duration		
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
MOM TALK												
Group	1	1809.23	20.54	0.00	1	29737.54	22.76	0.00	1	461.06	19.72	0.00
Error	22	1937.43	----	----	22	28740.45	----	----	22	514.48	----	----
Situation	1	0.13	0.00	0.95	1	1042.49	3.46	0.08	1	21.23	4.89	0.04
Sit*Group	1	36.13	1.16	0.29	1	392.32	1.30	0.27	1	19.27	4.44	0.05
Error	22	684.12	----	----	22	6625.99	----	----	22	95.48	----	----
MOM SILENT												
Group	1	2464.56	29.80	0.00	1	29347.50	22.50	0.00	1	21.23	1.45	0.24
Error	22	1819.75	----	----	22	28689.81	----	----	22	323.24	----	----
Situation	1	1.10	0.04	0.84	1	1062.85	3.58	0.07	1	8.99	0.91	0.35
Sit*Group	1	55.10	2.18	0.15	1	404.85	1.36	0.26	1	0.73	0.07	0.79
Error	22	556.21	----	----	22	6527.63	----	----	22	218.25	----	----

TABLE 30

Three-way ANOVA Summary Table:
Mother Vocalization at 12 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
Group	1	4248.53	25.30	0.00	1	0.64	0.45	0.51	1	142.21	9.91	0.00
Error	22	3694.21	----	----	22	31.31	----	----	22	315.85	----	----
Situation	1	0.15	0.00	0.96	1	4.62	9.32	0.01	1	1.08	0.16	0.70
Sit*Group	1	90.24	1.65	0.21	1	0.05	0.10	0.76	1	13.75	2.01	0.17
Error	22	1204.92	----	----	22	10.91	----	----	22	150.83	----	----
Vocalization	1	95.69	33.43	0.00	1	25721.28	9.86	0.00	1	90.17	3.80	0.06
Grp*Vocalization	1	25.27	8.83	0.01	1	59084.38	22.65	0.00	1	340.09	14.34	0.00
Error	22	62.97	----	----	22	57398.95	----	----	22	521.87	----	----
Sit*Vocalization	1	1.00	0.62	0.44	1	2105.29	3.52	0.07	1	28.92	3.91	0.06
Grp*Sit*Vocalization	1	1.00	0.62	0.44	1	797.12	1.33	0.26	1	6.25	0.84	0.36
Error	22	35.41	----	----	22	13142.71	----	----	22	162.90	----	----

Tukeys ($p \leq .05$)

Frequency:	Talk > Silence
Duration:	Talk > Silence
Mean Duration:	no difference

Table 31

Two-way ANOVA Summary Table:
Mother Vocalization at 24 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
Mom Talk												
Group	1	46.34	0.46	0.51	1	1484.39	1.02	0.32	1	0.25	0.15	0.70
Error	22	2222.66	----	----	22	31869.61	----	----	22	36.58	----	----
Situation	1	2.94	0.07	0.80	1	60.80	0.49	0.49	1	0.28	0.85	0.37
Sit*Group	1	12.94	0.30	0.59	1	180.80	1.47	0.24	1	0.77	2.30	0.14
Error	22	950.98	----	----	22	2703.12	----	----	22	7.31	----	----
Mom Silent												
Group	1	2.86	0.03	0.85	1	1389.24	0.97	0.33	1	2.01	0.92	0.35
Error	22	1816.81	----	----	22	31396.43	----	----	22	52.49	----	----
Situation	1	10.15	0.31	0.58	1	48.67	0.38	0.54	1	0.12	0.11	0.74
Sit*Group	1	10.15	0.31	0.58	1	167.42	1.32	0.26	1	0.77	0.69	0.41
Error	22	713.85	----	----	22	2782.24	----	----	22	24.63	----	----

TABLE 32

Three-way ANOVA Summary Table:
Mother Vocalization at 24 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
Group	1	36.10	0.20	0.66	1	0.79	1.33	0.26	1	0.49	0.47	0.50
Error	22	3901.23	----	----	22	13.05	----	----	22	23.07	----	----
Situation	1	14.75	0.20	0.66	1	0.89	1.23	0.28	1	0.00	0.00	0.98
Sit*Group	1	23.01	0.31	0.58	1	0.13	0.18	0.68	1	0.00	0.00	1.00
Error	22	1620.95	----	----	22	16.00	----	----	22	17.88	----	----
Vocalization	1	349.31	55.59	0.00	1	7426.14	2.58	0.12	1	0.86	0.29	0.60
Grp*Vocalization	1	13.10	2.08	0.16	1	2872.84	1.00	0.33	1	1.96	0.65	0.43
Error	22	138.24	----	----	22	63252.99	----	----	22	65.99	----	----
Sit*Vocalization	1	1.08	0.54	0.47	1	109.13	0.44	0.51	1	0.39	0.61	0.44
Grp*Sit*Vocalization	1	0.08	0.04	0.84	1	348.09	1.40	0.25	1	1.54	2.41	0.14
Error	22	43.87	----	----	22	5469.37	----	----	22	14.07	----	----

Tukeys ($p \leq .05$)

Frequency: 1 > 2 Talk > Silence
Duration: no difference
Mean Duration: no difference

significantly in mean duration or total duration, nor were there significant interactions between code, group and situation. Furthermore, all situations and group differences found at 12 months had disappeared: at 24 months, there were no differences between groups or between situations in the frequency, mean duration or total duration of talking and silence. In both groups, and in each situation, mothers alternated very regularly between equal episodes of talk and silence.

A visual inspection of the means at the two age levels showed that at 24 months mothers alternated more frequently between talk and silence, while mean durations were similar or shorter. An age x group interaction in total duration also seems apparent: at 24 months, mothers of handicapped babies spent more time in silence and less in talk than at 12 months, while mothers of nonhandicapped babies did the opposite. Further analyses are needed to examine these and other possible age differences.

Occurrences of Dyadic Vocalization

Using the same codes for baby and mother vocalization just discussed, 6 states of dyadic vocalization were created by combining each code for mothers' vocalization with each code for baby vocalization. The resulting dyadic states were as follows (note again that the baby's code always appears first in the dyadic state code, followed by the mother's code):

SS = both silent
VV = both talk
SV = baby silent/mom vocalizing
VS = baby talk/mom silent
FV = baby fuss/mom talk
FS = baby fuss/mom silent

Twelve Months. Results (Table 33-37) show that comparisons of the six dyadic states yielded significant differences in frequency of occurrence, mean duration and total duration. The two states in which the babies

TABLE 33

Frequency of Dyadic Vocalization in Toy Situations at 12 Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Baby Talk Positive/ Mom Talk Positive	8.09	6.69	4.82	3.97	7.15	4.86	5.85	6.40
Baby Talk Positive/ Mom Silent	3.73	4.80	1.55	1.75	7.85	6.81	5.54	5.36
Baby Silent/ Mom Talk Positive	21.09	5.05	20.09	6.04	27.92	9.02	30.31	8.42
Baby Silent/ Mom Silent	15.73	6.25	13.36	6.12	27.08	7.40	29.39	8.76
Baby Fuss/ Mom Talk Positive	0.09	0.30	0.00	0.00	0.15	0.38	0.69	0.95
Baby Fuss/ Mom Silent	0.18	0.60	0.00	0.00	0.00	0.00	0.92	1.32

TABLE 34

Duration of Dyadic Vocalization in Toy Situations at 12 Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D
Baby Talk Positive/ Mom Talk Positive	16.09	12.45	12.91	11.58	11.08	8.17	9.15	9.86
Baby Talk Positive/ Mom Silent	7.18	9.71	3.27	4.56	14.23	15.45	9.23	8.62
Baby Silent/ Mom Talk Positive	109.55	31.76	127.73	18.61	70.15	32.29	74.92	23.04
Baby Silent/ Mom Silent	45.46	26.59	35.00	19.41	83.31	31.12	83.31	28.06
Baby Fuss/ Mom Talk Positive	0.09	0.30	0.00	0.00	0.39	0.96	1.23	1.74
Baby Fuss/ Mom Silent	0.46	1.51	0.00	0.00	0.00	0.00	1.46	2.15

TABLE 35

Mean Duration of Dyadic Vocalization at 12 Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D
Baby Talk Positive/ Mom Talk Positive	2.16	0.63	1.97	1.46	1.34	0.52	1.35	0.09
Baby Talk Positive/ Mom Silent	0.98	1.00	1.21	1.16	1.58	0.49	1.56	0.82
Baby Silent/ Mom Talk Positive	5.67	2.89	7.11	3.00	2.44	0.66	2.47	0.43
Baby Silent/ Mom Silent	2.67	0.89	2.40	0.77	3.94	4.32	3.72	2.51
Baby Fuss/ Mom Talk Positive	0.09	0.30	0.00	0.00	0.39	0.96	0.86	1.21
Baby Fuss/ Mom Silent	0.23	0.75	0.00	0.00	0.00	0.00	0.71	0.85

TABLE 36

Two-way Summary Table:
Dyadic Vocalization at 12 Months

		Frequency				Duration				Mean Duration		
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
BABY TALK POSITIVE/ MOM TALK POSITIVE												
Group	1	0.02	0.00	0.98	1	229.10	1.70	0.21	1	6.21	7.24	0.01
Error	22	892.45	----	----	22	2972.15	----	----	22	18.87	----	----
Situation	1	62.50	2.82	0.11	1	77.64	0.90	0.35	1	0.10	0.14	0.71
Sit*Group	1	11.50	0.52	0.48	1	4.72	0.05	0.82	1	0.11	0.16	0.69
Error	22	487.48	----	----	22	1888.28	----	----	22	15.51	----	----
BABY TALK POSITIVE/ MOM SILENT												
Group	1	196.04	6.52	0.02	1	504.02	3.67	0.07	1	2.69	2.26	0.15
Error	22	661.63	----	----	22	3023.98	----	----	22	26.19	----	----
Situation	1	60.05	2.64	0.12	1	236.46	2.76	0.11	1	0.12	0.33	0.57
Sit*Group	1	0.05	0.00	0.96	1	3.55	0.04	0.84	1	0.19	0.52	0.48
Error	22	500.20	----	----	22	1884.45	----	----	22	7.99	----	----
BABY SILENT/ MOM TALK POSITIVE												
Group	1	865.94	10.97	0.00	1	25323.11	20.98	0.00	1	185.13	25.67	0.00
Error	22	1735.97	----	----	22	26550.55	----	----	22	158.67	----	----
Situation	1	5.71	0.18	0.68	1	1569.28	5.87	0.02	1	6.45	6.49	0.02
Sit*Group	1	34.13	1.06	0.32	1	535.94	2.01	0.17	1	5.90	5.93	0.02
Error	22	711.54	----	----	22	5878.97	----	----	22	355.20	----	----

Table DV [illegible]ont.

Table 36 (continued)

SOURCE	Frequency DF	SS	F	PROB.	Duration DF	SS	F	PROB.	Mean Duration DF	SS	F	PROB.
BABY SILENT/ MOM SILENT												
Group	1	2231.85	27.88	0.00	1	22116.41	20.56	0.00	1	13.69	1.69	0.21
Error	22	1761.07	----	----	22	23661.90	----	----	22	177.81	----	----
Situation	1	0.01	0.00	0.99	1	325.62	0.87	0.36	1	2.65	0.43	0.52
Sit*Group	1	65.01	2.46	0.13	1	325.61	0.87	0.36	1	0.46	0.07	0.79
Error	22	581.66	----	----	22	8242.36	----	----	22	135.50	----	----
BABY FUSS/ MOM TALK POSITIVE												
Group	1	1.70	4.50	0.05	1	6.92	4.62	0.04	1	3.96	5.65	0.03
Error	22	8.30	----	----	22	32.99	----	----	22	15.43	----	----
Situation	1	0.60	2.59	0.12	1	1.70	2.44	0.13	1	0.44	0.69	0.42
Sit*Group	1	1.18	5.12	0.03	1	2.62	3.76	0.07	1	0.95	1.50	0.23
Error	22	5.07	----	----	22	15.30	----	----	22	14.00	----	----
BABY FUSS/ MOM SILENT												
Group	1	1.64	2.93	0.10	1	3.02	1.71	0.21	1	0.68	2.10	0.16
Error	22	12.28	----	----	22	38.98	----	----	22	7.13	----	----
Situation	1	1.64	2.93	0.10	1	3.02	1.71	0.21	1	0.68	2.10	0.16
Sit*Group	1	3.64	6.52	0.02	1	10.94	6.17	0.02	1	2.59	8.00	0.01
Error	22		----	----	22	38.98	----	----	22	7.13	----	----

TABLE 37

Three-way ANOVA Summary Table:
Dyadic Vocalization at 12 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
Group	1	1454.26	26.48	0.00	1	0.27	0.29	0.60	1	10.52	5.10	0.03
Error	22	1208.16	----	----	22	20.45	----	----	22	45.36	----	----
Situation	1	17.39	0.59	0.45	1	0.70	0.98	0.33	1	1.70	1.39	0.25
Sit*Group	1	67.15	2.26	0.15	1	0.00	0.00	0.96	1	0.06	0.05	0.82
Error	22	645.01	----	----	22	15.72	----	----	22	26.94	----	----
State	5	28892.43	164.52	0.00	5	365577.87	142.96	0.00	5	582.74	35.74	0.00
Grp*State	5	1842.93	10.49	0.00	5	48182.32	18.84	0.00	5	201.84	12.38	0.00
Error	110	3863.55	----	----	110	56260.11	----	----	110	358.73	----	----
Sit*State	5	109.19	1.46	0.21	5	2213.68	2.72	0.02	5	9.46	1.19	0.32
Grp*Sit*State	5	48.35	0.65	0.67	5	883.38	1.08	0.37	5	10.14	1.27	0.28
Error	110	1644.21	----	----	110	17932.63	----	----	110	175.07	----	----

Tukeys

Frequency: ST, SS > TT, TS > FS, FT
Duration: ST > SS > TT, TS, FS, FT
Mean Duration: ST > SS > TT, TS, FS, FT
TT > FT, FS
TS > FS

were quiet (SS and SV) occurred significantly more frequently than any of the other four codes, followed by the two in which the babies talked (VV and VS); FS and FV occurred significantly less often than any of the others. In terms of total duration, SV overall accounted for the most time, followed by SS: each of these two states accounted for more time than any of the other codes. SV also had the longest mean duration, again followed by SS. However, as might be expected from the results for baby and mother vocalization separately, significant state x group interactions were found for each measure. In addition, while VV and VS did not differ in mean duration from each other, each lasted longer than one or both of the "baby fuss" states.

Analyses of the separate states showed that SS, SV, VS and FV all occurred more frequently in dyads with nonhandicapped babies, while FS tended to occur more frequently as well (p=.10); thus VV (both talk) was the only state for which no group difference in frequency was apparent, and which did not at least tend to occur more frequently in the dyads with nonhandicapped babies. VV was also one of the two states to show a group difference in mean duration: episodes of VV were shorter in the nonhandicapped dyads, while episodes of FV were longer. In terms of total duration, dyads with nonhandicapped babies spent proportionately more of their interaction time in SS and FV, and tended to spend more time in VS (p=.07). In the instruction situation, they also spent more time in FS, and tended to spend more time in FV as well (p=.07). Dyads with handicapped babies, in contrast, spent more time in SV in both situations. Overall time spent in VV did not differ significantly in the two groups.

On the total duration measure, situations differed only in SV, which accounted for more time in instruction than in play. SV also yielded the only significant difference between situations, with longer episodes in instruction than in play; both of these differences were largely accounted for by the handicapped group. As already indicated, a group x situation interaction for FS showed that in the nonhandicapped group it accounted for more time in instruction than in play, while the opposite was found in the handicapped group. There was also a tendency toward significance ($p=.07$) for the situation x group interaction for FV; this state also accounted for more time in instruction in the nonhandicapped group, and for less time in instruction in the nonhandicapped group.

A significant interaction was also found for the mean duration of FS, which showed an identical pattern to that of the total duration of FS.

Twenty-four Months. Tables 38-42 show that, at 24 months, SV still accounted for more of the interaction time than any of the other states, followed by SS, which accounted for more time than any of the remaining states. These results were no longer accounted for by the handicapped dyads alone. Unlike 12 months, episodes of SV were now more frequent than episodes of SS. Conversely, in terms of mean duration of episodes, SV and SS were no longer significantly different: each, however, was still longer than the other states. Further, the two states involving baby talk (VV and VS) now each accounted for more time than either of the two involving baby fuss (FS, FV). Overall, many of the group differences found at 12 months were no longer apparent, while situation differences had increased.

Comparisons between situations showed that state changes generally occurred less frequently in instruction than in play. This varied, however, for different states. In contrast to 12 months, VV now occurred

TABLE 38

Frequency of Dyadic Vocalization at 24 Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Baby Talk Positive/ Mom Talk Positive	15.46	12.29	11.64	10.02	16.46	8.61	9.39	3.28
Baby Talk Positive/ Mom Silent	10.27	9.10	9.46	8.93	17.77	9.43	10.77	7.16
Baby Silent/ Mom Talk Positive	34.09	5.19	35.73	8.14	31.00	9.27	34.23	6.33
Baby Silent/ Mom Silent	28.64	5.61	29.00	6.84	25.00	7.25	29.69	5.66
Baby Fuss/ Mom Talk Positive	0.00	0.00	0.36	1.21	1.31	4.42	0.39	1.39
Baby Fuss/ Mom Silent	0.00	0.00	0.36	1.21	1.69	5.81	0.69	1.93

TABLE 39

Duration of Dyadic Vocalization at 24 Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Baby Talk Positive/ Mom Talk Positive	27.82	22.93	19.46	16.45	22.69	11.45	13.08	5.17
Baby Talk Positive/ Mom Silent	14.36	11.55	13.91	13.90	29.15	20.75	17.23	13.52
Baby Silent/ Mom Talk Positive	77.18	27.94	83.46	24.88	65.69	31.04	82.77	27.82
Baby Silent/ Mom Silent	59.55	31.15	61.09	28.16	55.23	30.37	64.77	18.40
Baby Fuss/ Mom Talk Positive	0.00	0.00	0.55	1.81	1.92	6.64	0.62	2.22
Baby Fuss/ Mom Silent	0.00	0.00	0.55	1.81	4.62	16.34	1.23	3.32

TABLE 40

Mean Duration of Dyadic Vocalization at 24 Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Baby Talk Positive/ Mom Talk Positive	1.73	0.41	1.77	0.45	1.40	0.19	1.39	0.26
Baby Talk Positive/ Mom Silent	1.41	0.36	1.41	0.29	1.55	0.44	1.36	0.49
Baby Silent/ Mom Talk Positive	2.24	0.68	2.35	0.61	2.07	0.68	2.49	0.99
Baby Silent/ Mom Silent	2.03	0.90	2.15	1.05	2.36	1.78	2.18	0.62
Baby Fuss/ Mom Talk Positive	0.00	0.00	0.14	0.45	0.19	0.48	0.12	0.44
Baby Fuss/ Mom Silent	0.00	0.00	0.14	0.45	0.29	0.81	0.44	0.84

TABLE 41

Two-way Summary Table:
Dyadic Vocalization at 24 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
BABY TALK POSITIVE/ MOM TALK POSITIVE												
Group	1	4.62	0.05	0.83	1	394.23	1.36	0.26	1	1.51	9.46	0.01
Error	22	2094.30	----	----	22	6367.24	----	----	22	3.50	----	----
Situation	1	353.64	5.41	0.03	1	963.00	6.07	0.02	1	0.00	0.05	0.83
Sit*Group	1	31.64	0.48	0.49	1	4.66	0.03	0.87	1	0.00	0.05	0.78
Error	22	1439.28	----	----	22	3490.81	----	----	22	1.49	----	----
BABY TALK POSITIVE/ MOM SILENT												
Group	1	231.29	2.21	0.15	1	977.29	2.56	0.12	1	0.03	0.11	0.74
Error	22	2306.71	----	----	22	8382.63	----	----	22	5.45	----	----
Situation	1	182.10	4.01	0.06	1	456.42	4.47	0.05	1	0.10	1.19	0.29
Sit*Group	1	113.85	2.51	0.13	1	391.84	3.84	0.06	1	0.11	1.36	0.26
Error	22	998.82	----	----	22	2244.83	----	----	22	1.86	----	----
BABY SILENT/ MOM TALK POSITIVE												
Group	1	62.69	1.12	0.30	1	441.59	0.34	0.57	1	0.00	0.00	0.96
Error	22	1236.97	----	----	22	28977.89	----	----	22	21.47	----	----
Situation	1	70.57	1.29	0.27	1	1624.26	6.10	0.02	1	0.81	4.17	0.05
Sit*Group	1	7.57	0.14	0.71	1	347.76	1.31	0.27	1	0.28	1.42	0.25
Error	22	1206.43	----	----	22		----	----	22		----	----

Table DV24 cont.

Table 41 (continued)

		Frequency				Duration				Mean Duration		
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
BABY SILENT/ MOM SILENT												
Group	1	25.82	0.61	0.44	1	1.21	0.00	0.98	1	0.38	0.20	0.66
Error	22	934.66	----	----	22	27158.27	----	----	22	42.64	----	----
Situation	1	76.16	1.94	0.18	1	366.00	1.44	0.24	1	0.01	0.01	0.93
Sit*Group	1	55.82	1.42	0.25	1	190.33	0.75	0.40	1	0.26	0.30	0.59
Error	22	862.66	----	----	22	5605.98	----	----	22	19.28	----	----
BABY FUSS/ MOM TALK POSITIVE												
Group	1	5.26	0.55	0.47	1	11.83	0.53	0.47	1	0.10	0.37	0.55
Error	22	209.66	----	----	22	486.98	----	----	22	5.68	----	----
Situation	1	0.93	0.33	0.57	1	1.73	0.28	0.60	1	0.01	0.20	0.66
Sit*Group	1	4.93	1.73	0.20	1	10.23	1.68	0.21	1	0.13	1.85	0.19
Error	22	62.73	----	----	22		----	----	22	1.50	----	----
BABY FUSS/ MOM SILENT												
Group	1	12.17	0.73	0.40	1	83.71	0.79	0.38	1	1.06	1.63	0.21
Error	22	364.81	----	----	22	2321.21	----	----	22	14.25	----	----
Situation	1	1.21	0.27	0.61	1	24.01	0.50	0.49	1	0.24	1.31	0.26
Sit*Group	1	5.54	1.23	0.28	1	46.01	0.97	0.34	1	0.00	0.00	0.97
Error	22	99.27	----	----	22	1048.90	----	----	22	3.99	----	----

TABLE 42

Three-way ANOVA Summary Table:
Dyadic Vocalization at 24 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
Group	1	5.69	0.07	0.79	1	0.59	0.55	0.47	1	0.12	0.24	0.63
Error	22	1669.59	----	----	22	23.74	----	----	22	10.82	----	----
Situation	1	54.98	2.02	0.17	1	1.07	4.42	0.05	1	0.22	0.82	0.37
Sit*Group	1	18.89	0.69	0.41	1	0.04	0.18	0.68	1	0.09	0.34	0.57
Error	22	597.99	----	----	22	5.33	----	----	22	5.85	----	----
State	5	45146.48	181.33	0.00	5	239566.72	71.54	0.00	5	209.53	56.10	0.00
Grp*State	5	336.17	1.35	0.25	5	1909.27	0.57	0.73	5	2.95	0.79	0.56
Error	110	5477.52	----	----	110	73670.48	----	----	110	82.18	----	----
Sit*State	5	635.09	3.43	0.01	5	3435.32	4.11	0.00	5	0.95	0.79	0.56
Grp*Sit*State	5	200.46	1.08	0.37	5	990.81	1.19	0.32	5	0.69	0.58	0.72
Error	110	4071.20	----	----	110	18380.49	----	----	110	26.51	----	----

Tukeys (p $\overline{<}$ .05)

Frequency: ST > SS > TT, TS > FS, FT

Duration: ST > SS > TT, TS > FS, FT

Mean Duration: ST, SS > TT, TS > FS, FT

less frequently in instruction than in play; VS showed a familar tendency (p=.06). Episodes of SV, on the other hand, now lasted longer in instruction than in play. In total duration, as at 12 months, SV still accounted for more time in instruction than in play, while new situation differences had appeared in VV and VS: each of these now accounted for significantly less time in instruction. A near significant (p=.06) situation x group interaction for VS, however, showed that the difference between situations was not as great in the dyads with handicapped babies.

Of the group differences seen at 12 months, only one remained at 24 months. The mean duration of VV was still significantly longer in the handicapped than in the nonhandicapped dyads.

A visual analysis of results for the two ages showed that both groups of dyads engaged in more VV and VS at 24 than at 12 months, primarily due to an increased frequency of these two states at 24 months (i.e., mean durations remained about the same). SV had also increased in frequency. Age differences in the other states were less clear. Age x group interactions, however, seemed apparent in the total duration of SV, which accounted for more time in the nonhandicapped group at 24 than at 12 months, and accounted for less in the handicapped group. In contrast, at 24 months VV accounted for more time in the handicapped group than it had at 12, and in the nonhandicapped group accounted for less. While states in which the baby was fussing yielded no significant interactions between group and situation at 24 months, visual analysis shows that the interaction pattern was in the opposite direction to that seen at 12 months. At 12 months, more FV and FS occurred in instruction than in play in the nonhandicapped group, and less in instruction in the handicapped group. At 24 months, each state occurred more in instruction than in play in the handicapped group, and less in the nonhandicapped group.

Conditional Probabilites of Co-occurrence of Vocalization Codes

As was done with dyadic gaze, dyadic vocalization codes were further analyzed to determine whether particular combinations of codes of mothers and babies occurred more than would be expected from the overall proportions of occurrence of the individual codes. In general, proportionately far fewer predictable relationships were found for vocalization than for gaze; the probabilities of the different states were thus primarily related to the overall preparations of the different codes in each group.

Twelve Months. The only predictable relationships found at 12 months were in relation to "baby fuss" in the play situation. In the dyads with nonhandicapped babies, the combination F/V occurred together more than expected (i.e., the occurrence of each part of the combination was more predictable from the other than would be expected), while F/S (its reverse) occurred together less than expected (i.e., each part of the combination predicted that the other would be occurring less than expected); thus, when handicapped babies were fussing, their mothers were likely to be talking and unlikely to be silent. In the handicapped group, the relationship was one way: when their babies were fussing, mothers were very likely to be quiet. Knowing that the mother was talking or quiet, however, did not make fussing any more predictable. (Note that the relationship between fussing and talk is opposite in the two groups of dyads at this age level in this situation).

In the instructional situation, no predictable combinations occurred in either group. In the handicapped group, there was no baby fussing in the instructional situation. The nonhandicapped babies did fuss, but there were no conditional relationships between fussing and whether or not their mothers were talking.

Twenty-four Months. At 24 months, there were more relationships between babies' and mothers' vocalization in both groups. In the handicapped dyads, these were restricted to the play situation, while in the nonhandicapped dyads they occurred in both.

In Situation 2 (play), the two groups were opposite in the type of relationships found in different combinations of silence and vocalizing. In the dyads with handicapped babies, S/V ad V/S each occurred together less than expected, while S/S and V/V occurred together more than expected from the overall occurrence of talking and silence in either partner. Thus, when the baby was quiet, the mother was more likely than usual to be silent, too, and vice versa: however, when the mother was vocalizing, the baby was more likely than usual to also be vocalizing, and vice versa. In the dyads with nonhandicapped babies, the relationships were just the opposite: S/V occurred together more than expected and S/S less. Further, V/V occurred together less than expected and V/S more. F/V also occurred together less than expected (and F/S more) in the dyads with nonhandicapped babies: when the babies were fussing, the mothers were likely to be quiet, and when the mom was silent, the babies' fuss was more predictable than overall. (Note that for the nonhandicapped dyads, this is a change from 12 months).

In Situation 4 (instruction), there were no predictable relationships in the dyads with handicapped babies, just as there had been none in Situation 4 at 12 months. In the nonhandicapped dyads, relationships were very similar to those found in Situation 2. That is, the combination V/V occurred less than expected while V/S occurred more. When the baby was silent, mom was silent (combination S/S) less than expected. Unlike the relationship in Situation 2, however, the babies' silence no longer predicted the mothers' talking (combination S/T), although it was close to significance ($z=\pm 1.85$). When the baby was fussing, the mothers were less likely to talk than usual, as in Situation 2. However, the babies' fuss was not predictable from whether or not their mothers were talking.

Baby Vocalizations across Five Ages

Like the lag analysis on baby gaze at 12 months, this analysis is a departure from that of the preceeding sections. Again, however, it lends further context to the overall picture of vocalization. For the present analysis, the patterns of one code (baby "talk") were selected as being potentially particularly important in the establishment of a synchronous vocal/verbal interchange regardless of age level. Situation 1 (no toy/no instruction) was selected as the one in which interaction is most "social." Results appear in Tables 43-46.

No main effects were found for group for either of the three measures; handicapped and nonhandicapped babies "talked" equally as often and for episodes which were similar in length, and thus for similar proportions of the total interaction time. Significant main effects were, however, found for the age comparison for each measure. Post-hoc pair-wise comparisons (Tukey) indicated that at 30 months of age, babies vocalized significantly more frequently, and vocalization took up significantly more of the interaction time, than at 6, 12 or 18 months. While vocalizations at 30 months also lasted significantly longer than vocalizations at 18 months (but not at the other age levels), in general there was little change in the average mean duration across the 5 age levels. Thus, overall, the total duration measure reflected changes in frequency of vocalizations rather than in how long the vocalizations lasted.

TABLE 43

Frequency of Positive Vocalizations for Handicapped and Nonhandicapped Babies at Five Age Levels in a No Toy Play Situation

	Handicapped			Nonhandicapped		
	N	Mean	S.D.	N	Mean	S.D.
Six Months	5	10.00	5.61	8	16.50	7.15
Twelve Months	11	13.09	5.63	12	11.92	6.84
Eighteen Months	10	10.50	5.30	12	17.83	9.06
Twenty-four Months	11	17.73	10.14	13	17.38	8.87
Thirty Months	10	20.50	6.06	13	20.85	5.89

TABLE 44

Duration of Positive Vocalizations
for Handicapped and Nonhandicapped Babies
at Five Age Levels in a No Toy Play Situation

	Handicapped			Nonhandicapped		
	N	Mean	S.D.	N	Mean	S.D.
Six Months	5	24.00	15.03	8	50.00	21.55
Twelve Months	11	38.82	14.19	12	35.17	28.49
Eighteen Months	10	27.30	17.81	12	48.67	27.42
Twenty-four Months	11	56.27	38.85	13	45.92	24.74
Thirty Months	10	69.70	30.73	13	67.31	27.71

TABLE 45

Mean Duration of Positive Vocalizations
for Handicapped and Nonhandicapped Babies
at Five Age Levels in a No Toy Play Situation

	Handicapped			Nonhandicapped		
	N	Mean	S.D.	N	Mean	S.D.
Six Months	5	2.48	0.66	8	3.06	0.41
Twelve Months	11	3.06	0.55	12	2.75	0.62
Eighteen Months	10	2.49	0.62	12	2.66	0.34
Twenty-four Months	11	3.12	0.71	13	2.59	0.31
Thirty Months	10	3.29	0.84	13	3.24	0.95

TABLE 46

Anova Summary Table for Frequency,
Duration and Mean Duration
of Positive Vocalizations at
Five Age Levels in Two Groups of Babies

Source	df	SS	F	Prob.
Group	1	155.68	1.50	0.23
Error	22	2277.15	----	----
Age	4	1008.98	6.32	0.00
Age*Group	4	328.55	2.06	0.10
Error	73	2914.29	----	----
Corrected Total	104	6574.76	----	----

Table 46 (continued)

Source	df	SS	F	Prob.
Group	1	1329.86	0.92	0.35
Error	22	31762.10	----	----
Age	4	16625.73	8.77	0.00
Age*Group	4	5868.65	3.09	0.02
Error	73	34615.94	----	----
Corrected Total	104	86841.56	----	----

Table 46 (continued)

Source	df	SS	F	Prob.
Group	1	0.02	0.04	0.85
Error	22	13.09	----	----
Age	4	6.03	4.38	0.00
Age*Group	4	4.09	2.97	0.02
Error	73	25.11	----	----
Corrected Total	104	47.05	----	----

Significant interactions between group and age were found for both the mean duration and the duration measures; each of these seems to reflect that differences between groups were larger at some age levels than at others, rather than any particular differential trends in the two groups.

A second type of analysis, using event lags (to lag 2), was performed on the same data set from which the positive baby vocalization data was drawn; this analysis used each of the 5 codes for baby vocalization as a criterion event for each of the other codes. Again, no differences were found between groups. In each group, the few significant conditional probabilities indicated that the babies' vocalizations were likely to follow silences, and vice versa. That is, while the other codes (primarily fuss) did occur, none followed each other or these codes in any predictable manner.

It is clear from this analysis that, at least in this one situation, while vocalization tended to increase in frequency and total duration as the babies got older, there were few differences between groups in the length or amount of vocalizations, and no differences between groups in the probable sequencing of codes. Further analyses are needed of the content of the vocalizations of the two groups across ages, and of how these are integrated with vocalizations of the mothers in the two groups. An analysis of pauses between vocalizations might also be instructive.

Summary of Vocalization

The babies in this study, regardless of group, were very similar and consistent in their vocalization patterns: they were silent more than they talked, and fussed very little. At 24 months, vocalizing was more frequent than at 12, accounting for more of the interaction time. Only in fussing did the babies differ: at 12 months, mean durations of episodes of fussing were larger in the nonhandicapped group; in general, handicapped babies fussed a bit more in the play situation, while nonhandicapped babies fussed more in instruction. At 24 months, there were no group differences in any codes. Both groups of babies at 24 months vocalized less frequently and for shorter episodes, and thus less in general, in instruction than in play; a tendency in this direction was already apparent at 12 months.

Mothers in the two groups differed more than the babies, but only at 12 months. Group differences were especially apparent in the length of episodes of talking, which were considerably longer in the mothers of the handicapped babies. As a result, in this group episodes of talking lasted longer than did episodes of silence, and the overall proportion of talk was greater than that of silence. This was more apparent in the instruction situation, in which episodes of talking were even longer than in play. In mothers of the nonhandicapped babies, in contrast, episodes of silence were longer than episodes of talking, so that overall they were silent more than they talked, with little difference between situations. By 24 months, these differences had disappeared. Mothers of handicapped babies still talked a bit more than they were silent, but the proportions were very close; further, mother of the nonhandicapped babies now engaged in more equal amounts of talk and silence, with slightly more talk than silence in the instructional situation. Both groups alternated between talk and silence a lot more frequently (e.g, talk was more frequeht) at 24 than at 12 months.

To a large extent (but not completely) the dyadic states which characterized the dyads directly reflected the separate characteristic patterns of babies and mothers. Thus, at 12 months the most common state in the handicapped dyads was SV, while in the nonhandicapped dyads it was SS; at 24 months SV occurred more than SS in both groups. In general, the predominance of this pair of states over the two next most prevalent (VV and VS) and the least prevalent (FV and FS) seems directly related to the proportion of silence, talk and fussing in the baby; within pairs, the relative proportion in each state seems directly related to the amount of mother talk. The same relationship explains most of the differences between groups and between situations. Thus, at 24 months, VV, VS, SV and SS were all a bit more frequent than at 12 months since both mothers and babies engaged in more frequent vocalization. Similarly, the greater proportion of SV in instruction in the handicapped dyads at 12 months is due to situation differences in the mothers, while situation differences in the amount of FS and FV in the two groups of dyads directly reflect the amount of fussing that the babies do. The lesser proportions of VV and VS in instruction are related to differences in the amount of baby talk in the two situations.

While most overall probabilities of dyadic states (and differences between states in relation to group, situation and age) can be explained by differences in babies and/or mothers, some cannot. For the present set of data, this second type of outcome falls primarily into two categories, (a) those found in dyadic states which contained "baby fuss", and (b) those having to do with turn-taking. It was in these results that differences between groups became apparent.

At 12 months, some fussing occurred in both groups in Situation 2 (average of 5 seconds in each), while in Situation 4, the handicapped babies did not fuss at all and the nonhandicapped babies did so for an average of 35 seconds. Only in Situation 2 were there state probabilities which differed from unconditional probabilities, i.e, in which it may be assumed that other (or additional) factors were at work. In the nonhandicapped dyads, baby fussing and mother talking were likely to occur together more than expected, and this was predictable from each direction: given a baby fuss, moms were more likely to be talking than usual; given mom talk, babies were more likely to be fussing than would be expected. In the handicapped dyads, fuss and talk had the opposite relationship, but from only one direction: given a baby fuss, moms were more likely than usual to be silent, while mom silence did not mean that babies were more likely to be fussing. It is not clear from this analysis what influence the mothers had on their babies' fussing. What is clear is that fussing had a different meaning to the two groups of mothers, and (by extension) that the fussing may have differed in the two groups of babies. Subjective impressions from the videotapes indicate that this latter was indeed the case; handicapped babies tended to stay in one place and interject little fusses into their play, while nonhandicapped babies tended to try to leave the interaction and fuss when brought back. A more talkative mom might be expected in the latter case as compared to the former. In Situation 4 at 12 months, the handicapped babies did not fuss, and in the nonhandicapped dyads, states containing baby fuss reflected unconditional probabilities.

At 24 months the handicapped babies did not fuss at all in the play situation, while in Situation 4 the dyadic states containing baby fuss did not differ from unconditional probabilities. In the dyads with nonhandicapped babies, however, dyadic states containing fussing now differed from what was expected in both situations: when babies fussed, their mothers were less likely to talk than usual. Further, in Situation 2, this relationship was two-way: when the mothers were quiet, their babies were more likely to be fussing than usual. These patterns represent a change for the nonhandicapped group from 12 months, and reflect a similarity in situations to the handicapped dyads at 12 months: the nonhandicapped babies were no longer leaving the situation, but were fussing in short spurts within their toy play.

The second type of result which reflected significant conditional probabilities, i.e., those having to do with turntaking, showed that the dyads with handicapped babies may have had particular trouble particularly in the play situation at 24 months. The increased prevalence of SS and VV in the handicapped group at 24 months is a first indicator. A second and perhaps stronger indicator is the difference between groups in the conditional probabilities of the other two states involved with turntaking. In the dyads with nonhandicapped babies, in both situations, mutual talk and mutual silence occurred less than expected from unconditional probabilities. Instead, each member of the dyad was more likely to speak when the other was quiet and vice versa. In the dyads with handicapped babies, the patterns were different. Mutual silence and mutual talk each occurred more than expected, and SV and S each occurred less. In Situation 4, these states did not differ from their expected values. These results clearly suggest that while dyads with nonhandicapped babies engaged in alternating vocalization (i.e., "communication"), vocal overlap was more characteristic of handicapped dyads. The fact that the relationship was significant from both directions indicates that the overlaps were not necessarily due to one member or the other. Lag analysis will be necessary to clarify the roles of the members. Also, content analysis may reveal that different types of vocalization are occurring in the two groups.

Further analysis is also needed of the relationships between gaze and vocalization, i.e., of how differences in other types of cues may influence vocalization In general, however, it seems that the play situation may have been particularly difficult for dyads with handicapped babies.

Section 3:

Relationships between Babies' Gaze and Maternal Vocalization

The previous sections of this report have dealt with two different communicative modalities, gaze and vocalization, in isolation from one another, whereas in reality these (and other modalities such as touch or facial expression) typically occur in clusters. Breaking these clusters into smaller segments was felt to be beneficial and even necessary for understanding how different modalities relate to communication in dyads with handicapped babies. Putting them back together again, however, is also essential. The present set of analyses represents an initial step in combining the two separate modalities already examined, gaze and vocalization. Baby gaze and mother vocalization were the two sets of data chosen for combination in the present section. (Note that further analyses will be needed to combine baby vocalization and mother gaze, and to combine gaze and vocalization within the same individual. Also note that the following discussion does not address the issue of how dyads enter these different dyadic states; sequential analysis will be necessary for a more thorough interpretation of the results to be presented here.)

For this set of analyses, dyadic states were created by combining the three directions of baby gaze (Face, Toy, Away) with two conditions of mother vocalization (Vocalize, Silence), creating six states (BF/MV, BF/MS, BT/MV, BT/MS, BA/MV, BA/MS). Each measure (frequency, mean duration and duration) on these states was then subjected to three and two-way ANOVAs at 12 and 24 months of age. In addition, conditional probabilities were computed for mother vocalization given each direction of baby gaze, and vice versa, to determine whether the amount of mother vocalization was related to particular directions of baby gaze. (Note that a state change occurs when either or both partners change codes: because simultaneous changes were rare, it was usually the former. The question of who is responsible for change has been addressed using dyadic gaze states; similar analyses will be needed using the present states as well.)

Characteristics of Dyadic States

Twelve Months. As seen in Tables 47-51, two states, BT/MV and BT/MS, occurred more frequently and accounted for more of the total interaction time than any of the other four states. BT/MV also lasted longer than any other state, while episodes of BT/MS were longer than all others except BA/MV, which was the third most frequent, longest and prevalent state. The least common state was BF/MS, occurring less frequently, for shorter episodes and accounting for less time than any of the other states. These results for comparisons between states directly reflect, first, that babies looked at the toys for most of the interaction and at their mothers the least, and second, that mothers (handicapped and nonhandicapped combined) talked slightly more than they were silent. Thus, during episodes of the babies' attention to the toy (the most probable direction of baby looking), mothers were not only most likely to alternate their own gaze back and forth between the toys and the babies' faces (as discussed in a previous section), but also regularly interjected

TABLE 47

Frequency Measures of Direction of Baby Gaze and Type of Mother Vocalizations at Twelve Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Baby Look at Face/ Mom Talk	4.182	2.892	3.636	4.739	3.000	4.796	.462	.776
Baby Look at Face/ Mom Silent	2.091	2.071	1.091	1.578	3.308	4.328	.308	.855
Baby Look at Toy/ Mom Talk	16.909	8.573	15.636	7.201	26.000	9.345	31.231	9.038
Baby Look at Toy/ Mom Silent	12.364	7.061	10.636	7.339	25.538	5.060	29.923	8.401
Baby Look Away/ Mom Talk	9.727	5.867	8.727	9.593	7.077	4.462	1.462	1.761
Baby Look Away/ Mom Silent	5.727	6.035	3.818	5.845	6.154	4.525	1.385	2.063

TABLE 48

Duration Measures of Direction of Baby Gaze and Type of Mother Vocalizations at Twelve Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Baby Look at Face/ Mom Talk	10.000	8.390	11.091	20.172	4.462	8.181	.538	.967
Baby Look at Face/ Mom Silent	3.818	4.875	1.636	2.335	5.308	7.598	.385	1.121
Baby Look at Toy/ Mom Talk	74.091	39.660	96.273	56.870	63.000	30.776	82.385	26.903
Baby Look at Toy/ Mom Silent	36.091	27.595	28.455	22.120	78.231	24.853	90.692	25.210
Baby Look Away/ Mom Talk	39.545	43.163	30.182	39.370	12.154	9.326	2.308	2.810
Baby Look Away/ Mom Silent	12.273	14.430	7.545	12.801	12.615	10.697	2.538	4.484

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TABLE 49

Mean Duration Measures of Direction of Baby Gaze
and Type of Mother Vocalizations at
Twelve Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Baby Look at Face/ Mom Talk	1.854	1.239	1.896	1.287	.815	.737	.346	.555
Baby Look at Face/ Mom Silent	1.245	1.095	.673	.805	1.052	.707	.179	.443
Baby Look at Toy/ Mom Talk	4.510	1.608	5.785	4.073	2.329	.577	2.658	.673
Baby Look at Toy/ Mom Silent	2.514	1.473	2.158	1.031	3.252	1.528	3.515	2.548
Baby Look Away/ Mom Talk	3.522	2.572	2.525	1.722	1.443	.638	1.008	1.065
Baby Look Away/ Mom Silent	1.795	1.120	.807	.995	2.060	1.323	.640	.957

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TABLE 50

Two-way ANOVA Summary Table:
Dyadic States of Baby Gaze/Mother Vocalization at Twelve Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
BABY LOOK FACE MOM TALK												
Group	1	56.55	4.25	0.05	1	771.36	6.87	0.02	1	19.97	21.32	0.00
Error	22	292.43	----	----	22	2471.45	----	----	22	20.61	----	----
Situation	1	28.33	2.08	0.16	1	23.90	0.17	0.68	1	0.54	0.55	0.46
Sit*Group	1	11.83	0.87	0.36	1	74.90	0.53	0.47	1	0.78	0.80	0.38
Error	22	298.98	----	----	22	3115.92	----	----	22	21.52	----	----
BABY LOOK FACE MOM QUIET												
Group	1	0.56	0.08	0.78	1	0.17	0.01	0.93	1	1.41	1.64	0.21
Error	22	155.36	----	----	22	537.75	----	----	22	18.87	----	----
Situation	1	47.67	7.18	0.01	1	150.39	7.16	0.01	1	6.22	17.23	0.00
Sit*Group	1	11.92	1.80	0.19	1	22.39	1.07	0.31	1	0.27	0.74	0.40
Error	22	146.00	----	----	22	462.28	----	----	22	7.94	----	----
BABY LOOK TOY MOM TALK												
Group	1	1815.40	15.43	0.00	1	1858.86	0.72	0.41	1	83.90	13.25	0.00
Error	22	2588.52	----	----	22	57187.81	----	----	22	139.26	----	----
Situation	1	46.67	1.48	0.24	1	5147.31	10.36	0.00	1	7.66	2.72	0.11
Sit*Group	1	126.01	4.00	0.06	1	23.31	0.05	0.83	1	2.66	0.95	0.34
Error	22	693.24	----	----	22	10934.36	----	----	22	61.92	----	----

Table 50 (continued)

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
BABY LOOK TOY												
MOM QUIET												
Group	1	3139.30	40.52	0.00	1	32457.09	36.23	0.00	1	13.09	2.76	0.11
Error	22	1704.62	----	----	22	19707.83	----	----	22	104.44	----	----
Situation	1	21.04	0.95	0.34	1	69.36	0.19	0.66	1	0.03	0.02	0.90
Sit*Group	1	111.29	5.03	0.04	1	1203.36	3.38	0.08	1	1.14	0.74	0.40
Error	22	486.63	----	----	22	7838.89	----	----	22	33.79	----	----
BABY LOOK AWAY												
MOM TALK												
Group	1	292.94	8.02	0.01	1	9099.27	8.33	0.01	1	38.52	10.30	0.00
Error	22	803.98	----	----	22	24019.71	----	----	22	82.28	----	----
Situation	1	130.38	3.89	0.06	1	1099.36	2.15	0.16	1	6.11	4.20	0.05
Sit*Group	1	63.46	1.90	0.18	1	0.69	0.00	0.97	1	0.94	0.65	0.43
Error	22	736.54	----	----	22	11249.12	----	----	22	32.03	----	----
BABY LOOK AWAY												
MOM QUIET												
Group	1	12.00	0.49	0.49	1	64.81	0.46	0.50	1	0.03	0.02	0.89
Error	22	542.98	----	----	22	3092.66	----	----	22	35.01	----	----
Situation	1	132.87	6.36	0.02	1	652.93	6.41	0.02	1	17.26	19.53	0.00
Sit*Group	1	24.37	1.17	0.29	1	85.26	0.84	0.37	1	0.56	0.63	0.44
Error	22	459.61	----	----	22	2242.55	----	----	22	19.45	----	----

TABLE 51

Three-way ANOVA Summary Table:
Dyadic States of Baby Gaze/Mother Vocalization at 12 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
Group	1	846.95	19.22	0.00	1	6.49	0.99	0.33	1	49.50	23.07	0.00
Error	22	969.53	----	----	22	144.76	----	----	22	47.22	----	----
Situation	1	111.50	6.11	0.02	1	0.03	0.00	0.95	1	9.42	6.03	0.02
Sit*Group	1	0.65	0.04	0.85	1	6.85	1.15	0.29	1	0.50	0.32	0.58
Error	22	401.46	----	----	22	130.46	----	----	22	34.36	----	----
State	5	21410.10	92.03	0.00	5	246608.17	50.76	0.00	5	304.37	18.96	0.00
Grp*State	5	4469.79	19.21	0.00	5	44245.07	9.11	0.00	5	107.41	6.69	0.00
Error	110	5118.35	----	----	110	106872.45	----	----	110	353.25	----	----
Sit*State	5	312.92	2.85	0.02	5	7140.28	4.40	0.00	5	29.07	4.49	0.00
Grp*Sit*State	5	348.22	3.17	0.01	5	1403.06	0.86	0.51	5	5.84	0.90	0.48
Error	110	2419.54	----	----	110	35712.66	----	----	110	142.29	----	----

Tukeys ($p \leq .05$)

Frequency:	3, 4 > 5, 6, 1 > 2	TV, TS > AV, AS, FV > FS
Duration:	3, 4 > 5, 6, 1, 2	TV, TS > AV, AS, FV, FS
Mean Duration:		TV > AV, AS, FV, FS
		TS > AS, FV, FS
		AV > FS

verbal comments. Interactions between state and group, however, like the interactions in the results for mother vocalization, show that the two groups of dyads were characterized by different proportions of the two most prevalent states. Differences found between the two groups showed that dyads with nonhandicapped babies changed states more frequently, and had states of a shorter average mean duration, than did dyads with handicapped babies.

Group comparisons showed that BT/MV and BT/MS each occurred significantly more often in the nonhandicapped group, with episodes of BT/MV lasting significantly longer in the dyads with handicapped babies, as would be expected from the longer vocalizations of these mothers. Overall, BT/MV was significantly more common in dyads with handicapped babies, while dyads with nonhandicapped babies spent significantly more time in BT/MS (as expected from the relative amounts of mother silence and baby looking at the toy). Other group differences showed that in dyads with nonhandicapped babies, BA/MV and BF/MV were also more frequent, lasted longer and accounted for more of the total time, than in dyads with handicapped babies.

In comparisons between the two situations, there were fewer state changes, and states had a shorter average mean duration, in the instruction than in the play situation. Significant interactions between state and group, and between state and situation, however, showed that these general results varied in relation to particular states. Results for each state showed that episodes of BA/MS occurred less frequently, were shorter, and accounted for less time in the instructional situation, as did episodes of BF/MS. A situation x group interaction in the frequency of

BT/MS showed that in the nonhandicapped dyads it occurred more frequently in instruction than in play, while in the handicapped dyads it was more frequent in play. The situation difference in BA/MV was also significant (less with instruction), although it was found only in the handicapped dyads. The only state for which this situation difference was clearly reversed was BT/MV, which accounted for more time in instruction than in play.

Thus, at 12 months, dyads with nonhandicapped babies engaged in more state changes than did dyads with handicapped babies, accounted for by the higher frequencies of BT/MV and BT/MS in that group: all other states were more frequent in the handicapped group. Further, episodes of BT/MV lasted longer than in the handicapped group, especially in the instructional situation. In addition, the instructional situation, as compared to play, was in general characterized by more frequent state changes and by more time spent with the baby attending to the toy and the mother vocalizing. The dyads with nonhandicapped babies in general alternated fairly evenly between BT/MV and BT/MS, with episodes of BT/MS lasting somewhat longer and taking up somewhat more of the total time. In contrast, dyads with handicapped babies also alternated fairly equally but more seldom between these two states, with episodes of BT/MV lasting a good deal longer and hence accounting for more of the total interaction time.

Twenty-four Months. At 24 months (Tables 52-56), as at 12 months, BT/MV and BT/ MS occurred more frequently, lasted longer and accounted for more of the interaction than any of the other states.

Visual analysis of the means showed that the frequency of each of these two states had increased. In the nonhandicapped group, all other

TABLE 52

Frequency Measures of Direction of Baby Gaze and Type of Mother Vocalizations at Twenty-four Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Baby Look at Face/ Mom Talk	5.364	7.215	4.091	5.486	2.077	4.873	.308	.480
Baby Look at Face/ Mom Silent	4.273	6.262	3.000	4.712	2.308	6.033	.308	.480
Baby Look at Toy/ Mom Talk	25.727	13.039	27.727	16.584	33.692	9.656	36.231	7.373
Baby Look at Toy/ Mom Silent	22.727	11.559	23.182	13.797	31.538	7.149	32.231	7.014
Baby Look Away/ Mom Talk	15.909	10.559	12.000	11.507	4.846	5.655	.846	.801
Baby Look Away/ Mom Silent	12.364	9.801	9.909	12.062	5.154	5.383	.923	.862

TABLE 53

Duration Measures of Direction of Baby Gaze
and Type of Mother Vocalizations at
Twenty-four Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Baby Look at Face/ Mom Talk	11.00	16.619	6.455	8.525	3.538	8.100	.308	.480
Baby Look at Face/ Mom Silent	6.091	9.534	5.000	8.319	3.769	9.619	.308	.480
Baby Look at Toy/ Mom Talk	57.636	36.042	68.818	46.186	77.462	34.367	94.462	28.430
Baby Look at Toy/ Mom Silent	44.818	29.681	48.000	35.111	74.769	29.516	81.923	26.657
Baby Look Away/ Mom Talk	34.818	34.222	23.182	26.328	7.769	9.284	1.462	1.450
Baby Look Away/ Mom Silent	21.636	19.795	20.091	30.905	9.308	10.379	.923	.862

TABLE 54

Mean Duration Measures of Direction of Baby Gaze and Type of Mother Vocalizations at Twenty-four Months

	Handicapped Babies (N=11)				Nonhandicapped Babies (N=13)			
	No Instr		Instr		No Instr		Instr	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Baby Look at Face/ Mom Talk	1.427	1.295	.860	.881	1.000	1.063	.308	.480
Baby Look at Face/ Mom Silent	.851	.735	.739	.930	.892	1.919	.308	.480
Baby Look at Toy/ Mom Talk	1.955	.919	2.175	.992	2.276	.788	2.753	1.326
Baby Look at Toy/ Mom Silent	1.805	.873	1.880	1.191	2.567	1.652	2.548	.857
Baby Look Away/ Mom Talk	1.846	.774	1.453	.857	1.008	.800	1.115	1.121
Baby Look Away/ Mom Silent	1.638	.798	1.319	1.010	1.359	.980	.692	.480

TABLE 55

Two-way ANOVA Summary Table:
Dyadic Baby Gaze/Mother Vocalization at 24 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
BABY LOOK FACE												
MOM TALK												
Group	1	148.91	6.08	0.02	1	551.71	6.22	0.02	1	2.86	2.82	0.11
Error	22	538.90	----	----	22	1952.21	----	----	22	22.34	----	----
Situation	1	27.57	1.06	0.31	1	180.15	1.70	0.20	1	4.73	5.62	0.03
Sit*Group	1	0.73	0.03	0.87	1	5.15	0.05	0.83	1	0.05	0.06	0.82
Error	22	570.24	----	----	22	2326.52	----	----	22	18.52	----	----
BABY LOOK FACE												
MOM QUIET												
Group	1	64.62	2.92	0.10	1	146.56	2.65	0.12	1	0.45	0.28	0.60
Error	22	486.63	----	----	22	1215.92	----	----	22	35.84	----	----
Situation	1	31.91	1.24	0.28	1	61.74	0.91	0.35	1	1.44	1.26	0.27
Sit*Group	1	1.58	0.06	0.81	1	16.74	0.25	0.62	1	0.66	0.58	0.45
Error	22	567.09	----	----	22	1498.07	----	----	22	25.17	----	----
BABY LOOK TOY												
MOM TALK												
Group	1	807.99	3.30	0.08	1	6159.09	2.49	0.13	1	2.41	1.32	0.26
Error	22	5390.83	----	----	22	54328.83	----	----	22	40.02	----	----
Situation	1	61.36	1.63	0.22	1	2366.10	13.47	0.00	1	1.45	4.68	0.04
Sit*Group	1	0.86	0.02	0.88	1	100.85	0.57	0.46	1	0.20	0.63	0.44
Error	22	830.62	----	----	22	3865.82	----	----	22	6.81	----	----

Table 55 (continued)

SOURCE	DF	Frequency SS	F	PROB.	DF	Duration SS	F	PROB.	DF	Mean Duration SS	F	PROB.
BABY LOOK TOY												
MOM QUIET												
Group	1	950.31	5.19	0.03	1	12154.71	7.81	0.01	1	6.10	3.00	0.10
Error	22	4024.61	----	----	22	34244.20	----	----	22	44.70	----	----
Situation	1	3.92	0.21	0.65	1	318.25	1.19	0.29	1	0.01	0.01	0.92
Sit*Group	1	0.17	0.01	0.92	1	47.00	0.18	0.68	1	0.03	0.03	0.86
Error	22	418.75	----	----	22	5874.66	----	----	22	18.66	----	----
BABY LOOK AWAY												
MOM TALK												
Group	1	1470.47	13.21	0.00	1	7085.76	9.18	0.01	1	4.11	3.58	0.07
Error	22	2448.84	----	----	22	16982.15	----	----	22	25.27	----	----
Situation	1	186.36	10.75	0.00	1	959.26	7.76	0.01	1	0.24	0.50	0.49
Sit*Group	1	0.02	0.00	0.97	1	84.59	0.68	0.42	1	0.75	1.51	0.23
Error	22	381.45	----	----	22	2720.66	----	----	22	10.15	----	----
BABY LOOK AWAY												
MOM QUIET												
Group	1	781.45	6.97	0.01	1	2955.42	5.04	0.04	1	1.09	1.38	0.25
Error	22	2465.55	----	----	22	12888.24	----	----	22	17.40	----	----
Situation	1	133.15	9.56	0.00	1	293.76	3.43	0.08	1	4.93	8.05	0.01
Sit*Group	1	9.40	0.67	0.42	1	139.35	1.63	0.22	1	0.01	0.01	0.92
Error	22	306.52	----	----	22	1882.90	----	----	22	13.46	----	----

TABLE 56

Three-way ANOVA Summary Table:
Dyadic States of Baby Gaze/Mother Vocalization at 24 Months

	Frequency				Duration				Mean Duration			
SOURCE	DF	SS	F	PROB.	DF	SS	F	PROB.	DF	SS	F	PROB.
Group	1	124.13	1.58	0.22	1	35.49	1.62	0.22	1	0.33	0.19	0.67
Error	22	1727.45	----	----	22	483.06	----	----	22	38.79	----	----
Situation	1	125.41	4.00	0.06	1	12.59	0.50	0.49	1	3.78	5.54	0.03
Sit*Group	1	2.66	0.08	0.77	1	25.91	1.02	0.32	1	0.00	0.00	0.99
Error	22	690.25	----	----	22	558.09	----	----	22	15.02	----	----
State	5	39678.13	64.05	0.00	5	241152.60	43.80	0.00	5	112.84	16.91	0.00
Grp*State	5	4099.62	6.62	0.00	5	29017.77	5.27	0.00	5	16.69	2.50	0.03
Error	110	13627.91	----	----	110	121128.49	----	----	110	146.78	----	----
Sit*State	5	329.19	3.04	0.01	5	4177.86	5.22	0.00	5	8.98	2.52	0.03
Grp*Sit*State	5	10.11	0.09	0.99	5	367.77	0.46	0.81	5	1.69	0.47	0.80
Error	110	2384.42	----	----	110	17610.54	----	----	110	78.45	----	----

Tukeys ($p \leq .05$)

Frequency: TV, TS > AV, AS, FV, FS

Duration: TV, TS > AV, AS, FV, FS

Mean Duration: TV, TS > AV, AS, FV, FS

states had concurrently decreased slightly in frequency of occurrence; in the handicapped group, however, the other four states were also more frequent. These differences would be expected from differences in the proportion of looks that the two groups of babies took in different directions at the two ages combined with the increased frequency of mother talking in each group. The two groups also showed differential change between ages in the mean durations of states. In the nonhandicapped group, there were few differences between the two ages; of the six dyadic states, only one (BT/MS) had clearly decreased in mean duration (due to more nearly equal episodes of vocalizations and silence by the moms) whereas none had increased. In the handicapped group, all states but one (BA/MS) had decreased in mean duration (probably due to the increase in looking away in the babies); this difference was especially seen in BT/MV and in BA/MV (related to shorter episodes of mom talk). In terms of total duration, in the nonhandicapped group, BT/MV at 24 months accounted for more of the interaction than at 12 months (being of shorter duration but more frequent because of more frequent vocalizations by the moms), while all other states accounted for somewhat less (having decreased in frequency but remained the same or decreased in mean duration). In contrast, in the handicapped group, the proportion of time accounted for by BT/MS had increased, as had BA/MS and MF/MS (all shorter but more frequent, with more mother silence in general), while the three states involving "mom talk" now conversely accounted for less time (more frequent but much shorter states, and less overall talk than at 12 months).

The majority of group differences found at 12 months were still apparent at 24 months. As before, BA/MV, BA/MS, BF/MV and BF/MS still occurred significantly less often in the dyads with nonhandicapped babies, while BT/MV still tended to occur less often in the handicapped group (p=.08); each of these results seems most related to group differences in the directions of baby looking. In terms of mean duration, episodes of BA/MV lasted longer in the handicapped group, as they had at 12 months; this also seems related to the babies' looking away, as mom vocalizations were shorter at 24 months. Group differences in the length of episodes of BT/MV and BF/MV (both of which had been longer in the handicapped group) had disappeared, probably also related to changes in mother vocalization, since these two directions of baby looking varied across groups. Differences between groups in total durations spent in the particular states were the same at 12 and 24 months: as would be expected from group differences in the directions of baby looks, handicapped dyads spent more time in BF/MV, BF/MS and BA/MS, and still tended to spend more time in BA/MV (p=.07); nonhandicapped dyads still spent more time in BT/MS. Thus, in general, frequencies of particular states were less similar across groups than at 12 months, and mean durations were more similar; the combination yielded similar types of group differences in total duration at the two age levels.

Situation differences in the occurrence of particular states were similar to those found at 12 months. BA/MV and BA/MS still occurred significantly less frequently in instruction than in play, and for shorter mean durations as well. In terms of total duration, BF/MS still accounted for significantly less time in instruction than in play. The situation difference in BA/MS (less in instruction) was now only a tendency (p=.08), while that for BT/MV (more in instruction) had disappeared. No new situation differences were found at 24 months.

Conditional Relationships between Baby Gaze and Mother Vocalization

As noted earlier, differences in occurrence may be related to the overall occurrence of a particular code in the baby, in the mother, or in both; many of the group and situation differences, and many of the age changes just discussed, seemed to be due to just such differences in occurrence. However, it is also possible that differences may be due to particular relationships between certain combinations of codes of the two partners. Conditional probabilities were therefore computed for each combination of baby gaze and mother vocalization in the same way as for dyadic gaze and dyadic vocalization.

Twelve Months. It was found that in the group of dyads with nonhandicapped babies, in neither Situation 2 nor Situation 4 did any of these state combinations occur any more or less than would be expected from the overall proportions of mother talk and baby gaze spent in the different codes. That is, the mothers of nonhandicapped babies tended to spend more time in silence than in vocalization (or equal amounts in each), and in each situation, this same pattern held regardless of where the baby was looking. Conversely, in each situation, the proportion of looks that the babies took in each direction were unrelated to whether the mother was talking or not. In dyads with handicapped babies, however, several relationships were found which differed from what was expected. In the play situation (Situation 2), when the babies were looking at the toys, the mothers talked less than would be expected from their overall rate of talking (combination BT/MV), while when the babies were looking away, the mothers talked more than would be expected (combination BA/MV). Conversely, when mothers were talking, their babies were less likely to be looking at the toys and more likely to be looking away than when the mothers were silent. The handicapped babies' looks at their mothers' faces had no relationship to whether the mothers talked more or less than they usually did.

In the instruction situation (Situation 4), the pattern was somewhat different. When the handicapped babies looked at their mothers' faces, the mothers talked significantly more than expected (combination BF/MV), and were silent less than expected. This relationship, however, was significant from only one direction: when their mothers were talking their babies were no more likely to be looking at their mothers than would be predicted from its overall occurrence. A one-way relationship was also found for BT/MS: when moms were silent, their babies were more likely than usual to be looking at the toys; knowing that the baby was looking at the toys, however, did not increase the predictability of mother silence.

Twenty-four Months. At 24 months, there were again no significant conditional relationships between baby looks and mother vocalization in the nonhandicapped dyads in either situation: regardless of where the babies were looking, the proportion of mother talk was the same, and regardless of whether the mother was talking or not the proportion of the babies' looks in different directions was the same.

In the dyads with handicapped babies, the picture was again somewhat different. In Situation 2 (play), when moms were silent, the babies were again more likely than usual to be looking at the boys (BT/MS). A tendency toward significance was also seen in the other direction; when the handicapped babies were looking at the toys, the mothers were somewhat more likely to be silent and less likely to be talking ($z=\pm1.87$). In Situation 4, only one relationship was found which differed from what would be expected, and this was one-way: when mothers of handicapped babies were talking, their babies were less likely than usual to be looking away.

Summary of Dyadic States of Baby Gaze/Mom Vocalization

Despite the babies' overwhelming engrossment with toys, from these analyses it is clear that mothers did their best to become a part of the babies' toy play and, as indicated by analyses of gaze, used the babies direction of gaze and undoubtedly the babies' actions with the toys to regulate their own entry into the situation. These situations were best characterized by the two dyadic states in which the baby was watching the toy and the mother was either talking or silent; the relative prevalence of these two states (as well as the other four), however, was different in the two groups, in the two situations, and across the two ages. In most cases, these differences between states could be explained by differences in the unconditional probabilities of the two codes which formed the particular states. (This does not, of course, explain why these particular codes differed: those differences have been specualted on somewhat in previous sections.) In other cases, additional information on the relationships between codes was available from the conditional probabilities.

The patterns of conditional probabilities in the present analyses indicated that (a) the partners in the nonhandicapped dyads were more independent of each other in both situations at both ages (this was also suggested by the results of analyses of dyadic gaze and dyadic vocalization), and (b) interactions between handicapped babies and their mothers were more difficult in the sense of achieving a reciprocal balance between interpersonal roles.

In the dyads with handicapped babies at 12 months, despite the fact that BT/MV was the most prevalent state, when babies looked at the toys, their mothers actually talked less than would be expected, and talked more than expected when the babies looked away. The former case represents an adaptive relationship in the sense that when the mother did vocalize, the babies looked at the toys less than expected (which would be undesirable). In the latter case, the relationship was not so adaptive, for when the mothers vocalized, the babies were also more likley to look away. Verbally drawing the babies' attention back to the situation would seem to be a very natural reaction to the babies' looks away, but in this case did not work very well. Even more troublesome, however, is that the mothers were not free to talk about the toys when the babies were looking at them, and thus could not take advantage of the babies' looks to enter the toy play; being quiet may help to keep the baby looking at the toy, but that leaves the mother with no role to play. Further, however, the handicapped baby's actions with toys may not be very satisfying; not only may the mother feel a strong urge to help, but the baby may actually need help in exploring the toy. Thus, there may be a conflict between the cues which the baby is giving and what the baby needs, creating a fine line between helping and causing the baby look away; the mothers' longer mean durations of talking may indicate that they are trying to get as much in as possible before the baby looks away. Further analysis is needed of the kinds of vocalization which the mother is using: if particular types could be related to the babies' looking away, then intervention might help the mother to reconcile this conflict. One final combination in Situation 2 at 12 months is interesting because no significant conditional relationship was found; contrary to what has been reported previously (Jones, 1977; 1980), no relationship was found between the babies' looks at the mothers' faces and the mothers' vocalization. The difference in situations and/or the age of the babies may explain this contradiction, but it obviously needs further exploration.

In Situation 4 at 12 months, when the babies looked at their mothers, their mothers did vocalize more than expected, perhaps in an attempt to draw their attention back to the toy. However, as with the babies' looks away in Situation 2, this may not have been an adaptive response, as the mothers' silence, not vocalization, was related to the babies' looking at the toys more and her face less. Given that this was an instruction situation, the mother may consequently have had a hard time balancing "teaching" and keeping the babies oriented to the toys.

At 24 months, fewer significant relationships were found. In Situation 2, while the handicapped babies still looked at the toys more when their mothers were quiet, their mothers now showed a tendency to talk more when their babies looked at the toys. However, mother vocalization was no longer related to more looking away; thus, the mothers were probably somewhat more free to take advantage of their babies' looks at the toy. In Situation 4 at 24 months, the baby's direction of looking had no relationship to the amount of mother talk. However, mother vocalization made it less likely that the babies would look away, further substantiating that at 24 months, mother vocalization may have had less of a negative influence on the babies' attention to the toys than at 12 months. (Note that this discussion does not address the issue of differences in quality of play occurring when mothers were talking or silent; it may be that mother talk was associated with more complex play by the baby, even though the babies may look at the toy less when the mother talks. This needs further exploration.)

In the dyads with nonhandicapped babies, no significant relationships between mother vocalization and baby gaze were found in either situation at either age: the babies looked most at the toy regardless of the mothers' vocalization, and regardless of where the babies were looking, the mothers talked in proportion to their overall amount of talk. This interpersonal independence indicates that both play and instruction occurred more easily than in the handicapped dyads, essentially running themselves. The fewer number of significant relationships in the handicapped dyads as the babies got older may mean that the interactions were becoming easier as the babies became more competent in their involvement with the toys. The present results indicate that this may be at least a partial explanation. The differences in the handicapped babies' directions of looking across the two ages, however, indicate that they had become less toy oriented. An alternative explanation for the fewer relationships at 24 months may be that the mothers were no longer trying as hard to maximize the babies' interactions with the toy, but were rather letting them, as in the nonhandicapped dyads, run themselves.

RESULTS: QUESTIONNAIRE, RATINGS AND DIARY

Coding of communicative modalities from videotape was the primary method of data collection used in this project. However, a number of other instruments were also included as a way of placing interpretation of the videotapes within the context of the everyday environment of the handicapped child and his family. The results obtained from these other instruments have not yet been examined to the same extent as those from the videotapes. However, preliminary analyses have been done on selected items or categories from the PBQR, the BPRS and the 24-hour Diary.

On the two rating scales, a visual analysis of means and standard deviations for each item for each group at each level was used to select items which looked as if they might distinguish between groups and/or ages: these were then subjected to statistical analysis. On the diary, broader categories were selected for analysis, as these seemed to be the most valid for compiling group data. Note also that data from the six-month age level has been included, even though the handicapped group at this age was small, male and severely handicapped.

Copies of each of the instruments in its entirety are included in the Appendices.

Play Behavior Questionnaire/Rating (PBQR)

The purpose of this instrument was to measure the mothers perceptions of play situations in which the baby engaged within the everday environment, focusing on (a) the importance of play and how much satisfaction was gained from it, (b) the types of play most commonly engaged in, and (c) the babies' most and least preferred types of play. The instrument was completed by the mothers at each six-month visit.

Means and standard deviations for each item for each group at each of the five age levels were visually inspected to select items which might differentiate between groups or ages. Each of these items was then subjected to a 2(group) x 5(age) repeated measures analysis of variance. Results for items showing significant differences on one or both variables are listed in Table 57. However, items which approached significance will be discussed briefly as well.

TABLE 57

Importance and Structure of Play (PBQR)

Variable	Handicapped Babies (n=9) $\bar{X}$	S.D.	Nonhandicapped (n=12) $\bar{X}$	S.D.	Factors	Significance Level
TYPE OF PLAY -Rough & Tumble	4.11	1.67	3.33	1.15	-	-
-Exercise Games	4.00	1.41	3.50	1.38	-	-
-Tactile Games	4.67	1.32	3.92	1.16	2	.05
-Conventional Games	4.89	1.36	3.92	1.38	-	-
-Imitation Games	4.78	1.39	4.00	1.65	-	-
-Play with toys-moving parts	3.89	2.03	5.00	1.35	1 2	.05 .00
-Play with toys-multiple parts	3.33	2.06	4.67	0.98	1 2	.00 .00
-Play with apparatus toys	3.22	1.86	4.50	1.17	1 2 3	.00 .00 .00
-Pretend games	1.78	0.97	5.00	1.48	1 2 3	.00 .00 .00
ATTITUDE ABOUT PLAY -Achore	1.78	0.67	2.50	0.80	-	-
-Rewarding/fulfilling	5.67	1.32	5.83	0.83	-	-
STRUCTURE OF PLAY -Plan activities	2.78	1.20	3.50	1.17	3	.04
-Learning games	5.56	1.01	5.33	0.98	-	-
-Child chooses game	2.89	1.17	4.50	0.80	1 2	.00 .00
-Teacher chooses game	5.11	0.93	3.30	1.06	1 3	.00 .04
IMPORTANCE OF PLAY FOR DEVELOPMENT -Learn thinking skills	6.44	1.01	6.18	0.98	-	-
-Learn play with toys	6.00	1.32	5.42	1.16	2	.01
-Try new activities	5.67	1.41	5.50	1.00	-	-

1 = group

2 = age

3 = age * group

Play Importance and Satisfaction

There were no age or group differences for any of the six items related to play satisfaction. In general, mothers rated play sessions with their babies as being fun and rewarding. Differences between groups and across ages were found, however, on several of the items designed to measure the mothers' perception of the impotance and structure necessary in play times.

In terms of its importance for various aspects of development, mothers consistently rated play between 5.5 and 7 (on a 7-point scale), i.e., as being of more than average importance for development. The importance of mother-child play for helping the baby to learn toy play skills was seen as decreasing with age; this trend was, however, clearer in the handicapped group. Mothers of the handicapped babies tended to rate play as being more important in helping their babies to develop thinking skills than did mothers of the nonhandicapped babies ($p=.08$). Responses related to the importance of structuring mother-child play indicated that each group saw the need for an average amount of structuring, and felt that they set aside about an average amount of time for play each day. Each group also felt that they played an average number of games that were purely for fun.

Four items dealt with more specific aspects of structuring, and each of these yielded one or more significant differences. Mothers of handicapped babies indicated that they more often used games suggested by a teacher or some other professional. An age x group interaction indicated that in the handcapped group this became less so as the babies get older, while in the nonhandicapped group it seldom occurred at any age. Significant group and age differences were also found in how often the games were chosen by the child rather than by the mother: this occurred significantly more in the nonhandicapped group and significantly more as the babies got older. A visual inspection of the means showed that this peaked in nonhandicapped children at 18 months, while in handicapped children it peaked at 24 months. A tendency toward a significant age x group interaction was also found in how important mothers thought it was to play games that helped the child learn specific things (p=.09). While both groups rated this item as being of more than average importance, mothers of the handicapped babies consistently rated it as equal or slightly more important at all age levels, and especially at six months. Finally, a significant age x group interaction was found in how important mothers felt it was to plan specific activities for play times. While this was consistently rated as more important in the handicapped group, it was seen as less important as the babies got older. In the nonhandicapped group, ratings were variable across ages.

Types of Play

This section of the PBQR contained 12 types of games listed roughly from simplest to most complex. At each age level, mothers rated each game in terms of how much she currently used it with the child. Responses for types of play were treated in the same way as those just described. Seven of the twelve games yielded no significant group or age differences (remembering that the initial "cut" was made visually, and that there might be items which were missed). Of these seven, all received "average" ratings for use (between 3 and 5).

Results for games showing significant differences between ages and/or groups also appear in Table 57. Tactile games (one of the two lowest level games) were rated as being used decreasingly as the babies got older, while the four highest level games (toys with moving parts, toys with multiple parts, apparatus toys, and pretend) were rated as being used increasingly as the babies got older. Each of these four was also rated as occurring more with the nonhandicapped babies. Age x group interactions were found for the latter three games, with the nonhandicapped babies peaking at 18 or 24 months and then declining slightly, and with more variable and lower ratings for the handicapped babies. Ratings for pretend play, the highest level game, remained consistently low in the handicapped group.

Of the seven games for which differences were not statistically significant, one showed a tendency toward a group difference (p=.09), with more exercise games (one of the lowest level games) being used with handicapped babies. Further, a tendency toward an age x group interaction (p=.09) was found for conventional games (e.g., peek-a-boo). These were increasingly used with the handicapped babies until 18 months, and then declined. The opposite pattern was found for the handicapped babies.

Most and Least Preferred Games

At each age level, the mothers were also asked to choose from the same list of 12 the two types of games that their babies liked most, and the two types that they liked least. These were summarized in terms of percent frequency, and the results for the most and least liked games are listed in Table 58. In cases were identical percent frequencies were found for more than one game, these have been listed on the same line. Where there was no clear second choice, only one game has been listed.

It is obvious from this table that mothers' perceptions of their babies' preferred and non-preferred games matched fairly closely what might be

TABLE 58

Percent Frequency of the Two Most and Two Least-Liked Games At Five Age Levels (PBQR)*

Age (Months)	Handicapped		Nonhandicapped	
	Most-Liked	Least-Liked	Most-Liked	Least-Liked
6 (hc: n = 5; nhc: n = 8)	a) exercise b) tactile	a) pretend	a) tactile b) simple toys	a) multiple part toys b) imitation
12 (hc: n = 11; nhc: n = 13)	a) listening b) conventional	a) exercise b) tactile; watching	a) conventional b) moving parts toys	a) exercise b) watching; pretend
18 (hc: n = 11; nhc: n = 12)	a) tactile b) listening	a) exercise; multiple toys, apparatus toys	a) rough & tremble b) moving parts	a) exercise b) pretend
24 (hc: n = 10; nhc: n = 13)	a) rough & tremble	a) pretend b) watching	a) apparatus toys b) multiple parts toys	a) watching; simple toys; pretend
30 (hc: n = 9; nhc: n = 12)	a) rough & tremble	a) pretend; simple toys	a) listening; pretend	a) simple toys b) imitation

*Items with equal percent frequencies are included on the same line.

expected from the average levels of cognitive development in the two groups of babies. For example, for the nonhandicapped babies, pretend play was among the least liked type of game until 30 months, and then became a most liked game; in the handicapped group at 30 months, pretend was still among the least-liked games. Similarly, in the nonhandicapped group the mothers perceived their babies as preferring increasingly complex toys. Further, they were perceived as progressing from games with more passive involvement, to games in which they took more active roles, and finally to games in which they were in charge or in an equal role with their partners...conversation ("listening") and pretend. In contrast, the most preferred games of the handicapped babies, as perceived by their mothers, consistently excluded toys. Like the nonhandicapped babies, however, these babies were also perceived as progressing from a preference for essentially passive games to games in which they were more active. This increased participation tended, however, to be physical rather than language or cognition based. In the nonhandicapped group, higher level cognitive activity was perceived as preferred at a later age level than were active physical games; it may be that the generally slower cognitive development of the handicapped group accounts for many of these difference.

Baby Play Rating Scale (BPRS)

Like the BPQR, this instrument was completed at each six month visit. One purpose of this rating scale was to obtain the mother's perception of the quality of the baby's response to different modalities and strategies used in the interaction, and her perception of his general temperament during interactions. A second purpose was to obtain a measure of how valid the taping session was as a representation of the baby's usual response to play. A visual inspection of means and standard deviations was again used to select individual items to be subjected to further analysis. This inspection yielded 30 of the original 63 items.

In general, mothers rated all items but three as occurring somewhat more frequently in everyday situations than they did during the taping; this result was probably due to the wording of the scale. However, visual inspection also showed that the group and age profiles were similar in the two sets of ratings, indicating that ratings of the videotaped situations were probably a valid representation of the relative everyday responsiveness of the babies to different types of interaction. The means of responses for "during the past week," rather than for "during taping," were used in the analyses of individual items. Items yielding significant or near significant results ($p \leq .10$) are listed in Table 59.

At a second level of analysis, all 63 items were grouped into 11 categories (each containing between 3 and 6 of the individual items) reflecting different aspects of cognition, temperament, and responsiveness to different types of stimulation used in play; those categories were those originally used to generate the entire list of items. Each category was subjected to further analysis, again using the means for behavior "in the previous week." Significant results for these larger categories also appear in Table 37.

Age differences for individual items showed that mothers rated their babies as tending to become generally less cooperative with increasing age ($p=.065$) although the mean rose again slightly at 30 months. This was clearly reflected in the videotapes: as the babies became more mobile and more self-directed, *they* wanted to control the interaction. The babies

TABLE 59

Mother Ratings of Age and Group Differences in Response to Play (BPRS)

Individual Items	Type of Difference	*F*	*p*	Description
Cooperation	age	2.32	.065	-tendency to be less cooperative with increasing age, though mean rises again at 30 months
Interested in Mom's sounds	age	3.68	.009	-less responsive with increasing age; six month age level differs significantly from every other (Tukeys)
Anticipates touch	group	4.73	.040	-nonhandicapped > handicapped
Surprise Mom: does new things	group	3.97	.060	-nonhandicapped > handicapped
Distracted by other sounds	group	4.04	.057	-nonhandicapped > handicapped
Hard to arouse to play	group x age	3.79	.008	-handicapped tend to be harder to arouse until 30 months, then easier
Item Groups				
Initiation	age	4.29	.004	-more with age, level off about 18 months; six months differs significantly from every other (Tukeys)
Responsiveness	age	2.28	.069	-no trend apparent; variable from age to age
Anticipation	group	6.09	.020	-nonhandicapped > handicapped
Distractibility	group	4.39	.048	-nonhandicapped > handicapped
Readability	group	6.67	.020	-nonhandicapped > handicapped

were also rated as becoming increasingly less interested in sounds that the mothers made, with the 6-month age level differing significantly from every other. The difference in the composition of the handicapped group at six months may largely account for this result. However, as babies became more interested in other aspects of the environment and in more complex verbalization, it also seems plausible that they would be less interested in mother vocalization alone.

Group differences were found for three individual items; in each case, the nonhandicapped babies were rated higher than were the handicapped babies. These were: anticipates touch, surprises mom by doing something new (p=.06), and is distracted by sounds outside of the interaction. Again, the ratings of the two groups of mothers seem to reflect the very real differences in the cognitive development of their babies.

One item, "hard to arouse to play," showed a significant age by group interaction; handicapped babies were seen as being harder to arouse until 30 months, and then becoming easier to arouse, than nonhandicapped babies. It may be that by 30 months the nonhandicapped babies were "into doing their own thing," and less interested in playing with their mothers. This is supported by the types of most preferred play reported earlier.

Results for the ANOVAs performed on groups of items also yielded age and group differences. "Initiation" was perceived as increasing with age, leveling off at about 18 months; again the 6-month data may account for most of this result, as it differed significantly from every other age level. The results for Responsiveness also approached significance on age (p=.069), with ratings being variable from age to age rather than showing any consistent trend. Three categories of grouped items, Anticipation, Distractibility and Readability, were rated by the mothers as being more characteristic of the nonhandicapped than of the handicapped babies. These results thus closely resembled those found with the individual items.

24-Hour Diary At 5 Age Levels

At each six-month visit, mothers were asked to keep a diary of a typical 24-hour period in their babies' lives at that time. Predetermined categories were supplied to the mothers for entry into the diary. For the purposes of analysis, each hour was considered to be an interval, and the percent of intervals in which a particular code appeared was used as a score for that category. Tables 60 and 61 thus represent the average percent of intervals in which those codes occurred in each group at each age level. Table 60 represents global categories of activity in which the babies were typically engaged while Table 61 represents with whom play activities were likely to occur. These means have not yet been subjected to any statistical analysis. However, visual analysis of Table 60 shows little difference between groups in amount of play or sleep, while there does seem to be a group difference in the amount of time spent in planned activity (more in handicapped group). Further, age trends are apparent in the amount of sleep in both groups (less as the babies get older), and in the amount of time spent in planned activity by the nonhandicapped babies (more as the babies get older).

In terms of who the babies play with, the category with the highest mean is "alone," with no apparent group or age differences. Play with siblings also shows no apparent differences. Play with father, however, is shown as being more common in the nonhandicapped group at 6 months, and then more common in the handicapped group at 12, 18, 24 and 30

TABLE 60

Results* of 24-Hour Diary across 5 Ages: Type of Activity

			Total Play			Planned Activity			Sleep	
	Age in Months	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.
Handicapped	6	4	5.25	3.59	4	0.50	1.00	4	16.50	0.58
	12	8	8.50	3.55	8	1.88	1.96	8	13.25	1.98
	18	9	5.44	3.54	9	1.33	2.06	9	12.67	1.94
	24	8	7.50	5.13	8	1.75	2.31	8	12.38	1.92
	30	8	7.50	2.45	8	1.00	1.41	8	12.38	0.92
Nonhandicapped	6	7	7.00	2.83	7	0.43	0.79	7	15.86	1.46
	12	11	5.82	2.56	11	0.36	0.92	11	14.82	1.99
	18	10	5.80	2.94	10	0.70	1.34	10	13.30	1.70
	24	11	6.09	2.63	11	0.82	1.08	11	13.36	1.96
	30	11	7.45	3.62	11	1.81	1.54	11	12.82	1.78

*Means represent average % intervals; out of 24 hours, means thus represent the average number of hourly intervals in which that category occurred.

TABLE 61

Results* of 24-Hour Diary across 5 Ages: Who the Baby Played With

	Age in Months	Play With Father			Play With Mother			Play With Siblings			Play Alone		
		N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.
Handicapped	6	4	0.00	0.00	4	0.75	0.96	4	1.00	2.00	4	4.25	3.50
	12	8	0.88	1.25	8	1.00	1.20	8	2.00	3.34	8	5.88	2.36
	18	7	1.57	1.51	7	2.29	2.14	7	1.14	1.86	7	3.86	2.73
	24	6	1.50	2.81	5	1.60	2.30	5	2.40	2.88	5	3.80	4.09
	30	6	2.50	2.35	6	1.83	1.33	6	1.50	1.87	6	4.17	2.64
Nonhandicapped	6	5	0.80	0.84	5	2.80	2.17	5	0.80	1.10	5	6.00	1.58
	12	10	1.10	1.60	10	2.40	2.72	10	1.40	2.27	10	4.20	1.81
	18	9	0.89	1.83	9	2.33	2.40	9	0.78	1.72	9	3.11	2.57
	24	9	1.11	1.17	9	2.67	2.12	9	2.22	3.35	9	2.22	2.17
	30	9	0.89	1.05	9	1.44	1.59	9	3.56	4.75	9	4.22	3.73

*Means represent average % intervals; out of 24 hours, means thus represent the average number of hourly intervals in which that category occurred.

months. Play with mother shows a fairly consistent group difference, with more occurring in the nonhandicapped group. Mothers of nonhandicapped babies are also shown as playing with their babies more than fathers do, while the amounts are fairly equal in mothers and fathers of the handicapped group.

Summary

Mothers of the two groups of babies were astonishingly similar in their responses to items concerned with the importance of play and their own responses to playtimes with their babies. In general, both groups of mothers reported enjoying playtimes and feeling that they were very important. Although each group felt that they "played" about an average amount and placed about an average amount of structure on the play, specific items clearly differentiated between groups, possibly indicating a good deal of influence from intervention programs. The importance of structure, however, was seen to decrease with age, perhaps reflecting such factors as new siblings to care for, becoming settled into a knowledge of what the baby is and or is likely to become, or simple boredom with doing similar activities for too long a time. Perhaps, too, intervention activities had come to seem like the natural way of doing things with that baby, and were no longer thought of as intervention.

Ratings of the mothers' use of games and ratings of child preferences for different types of games, both reflect what would be expected from the overall differences in development in the two groups. It is interesting that while the higher level games increased in use or preference with age, not all of the lower level ones decreased; this indicates not only more variety in games as the babies got older, but possibly some change in the quality of play such as rough and tumble or conventional games. It is curious, however, that even when the mothers listed rough and tumble as a most preferred game, they did not indicate that they used it; perhaps that was seen as the fathers' domain, as has been found in other research (Lamb, 1977). It is also interesting that, while the two groups of babies were perceived to differ in their preferences for cognitive or physical activity, both groups were increasingly rated as preferring games in which they themselves were more active. These perceptions, if valid, challenge those who wish to interact with handicapped babies in play or intervention situations. First, while a handicapped baby may be most socially responsive to gross physical activity such as rough and tumble play, and least responsive to situations in which toy play or role-taking is involved, the latter may be very important to his further development. Second, many intervention situations place the handicapped baby, sometimes unavoidably, in a passive role...watching, listening, and then being expected to respond in some way which is probably somewhat difficult for him. Thus, the very types of games in which he is most often involved may contain characteristics which make them his least-preferred.

Significant differences between groups on the BPRS, like many of those related to play preference and use, also reflect what would be expected. Anticipation and distractibility (wanting to leave and do something else, being more interested in the camera than the mother's play) are clearly cognitively related. Results for Readability support what others have reported (Emde, Katz & Thorpe, 1978; Fraiberg, 1974): handicapped babies may be more difficult to interact with because their social cues are not as easy to interpret.

Results of the diaries reflect a great deal of similarity in the "schedules" of handicapped and nonhandicapped babies. The most intriguing differences are those which indicate that nonhandicapped babies are engaged in more play with their mothers than are handicapped babies, and that mothers play with their nonhandicapped babies more than fathers do while mothers and fathers of handicapped babies play with their babies about equally. Both of these differences may reflect the amount of time that mothers of handicapped babies spend with their babies in planned activities as opposed to play: time in interaction with the babies may not be less, but may rather be more of a combination of play and instruction than is true with fathers or with mothers of nonhandicapped babies. If this interpretation is correct, then the two tables together show that mothers with handicapped babies probably spent more time engaging in interaction with their babies than did fathers or other mothers; the interaction was just of a different type.

In general, there was very good agreement among similar sections of the different instruments. It was surprising how few differences were found between groups, and the specificity of the areas in which those differences which were found did occur. It was the impression of the investigators that there were few differences in the everyday lives of the two groups (as groups: as individual families, there were many differences), perhaps due to the procedures used for obtaining families to participate (Walker & Crawley, 1983). It was also our impression, however, that unlike what was reported by the mothers, play purely for the sake of play was not a common occurrence between mothers and their handicapped babies, nor did it have the general joyful quality found between mothers and nonhandicapped babies. The mothers rather seemed to simply accept the individual differences of their babies, and to adapt their own roles and interactions as a natural way of behaving: they did not necessarily perceive of themselves as making these adaptations. These impressions more closely match what one would expect from the results obtained from the videotapes. More intensive observation of everyday events would, however, be necessary to test these impressions.

DISCUSSION

Despite the wide variation between individuals on such factors as personality, age and mental ability, "communicating" with others, the combination of modalities and roles, the flow from one point to the next, somehow occur. When one partner is a baby, this seems to be possible primarily because (a) adult and baby are "preadapted" for social interaction (Schaffer, 1977), i.e., they speak the same "language", and (b) partners mutually adjust to fit with both the unique interactive characteristics of the other and with the demand characteristics of different situations. A comparison of interactive patterns in different situations and in different types of partners should therefore help to clarify the functions of particular patterns of communication in maintaining interactions in relation to different situational intents, and with partners with differing characteristics. These in turn may clarify the roles of partners in different types of situations and how these change over time.

Two situations were chosen for emphasis in the present report, including (a) toy play, and (b) instruction with toy. These were chosen for two reasons. First, by 12 months of age (the first for which the groups were comparable), toy play and general engrossment with objects occupies much of the baby's attention. Second, the intervention situation is very important in the life of the handicapped baby (Mogford, 1977; Walker, 1981), as evidenced in the present study. By studying how the two groups differ in these two situations, it should be possible to more accurately predict the problems that dyads with handicapped babies may have in accomplishing mutual integration of behaviors, and thus in accomplishing the learning that normally takes place in these two very important situations. By definition, play and instructional situations should differ in ways which should result in different communicative needs of both members. Former research has shown that in play, the mother is very likely to match her comments to what the baby is already attentive to (Bruner, 1975; Collis, 1977), and to respond to looks at her face if they were requests for affirmation (Jones, 1977, 1980). The baby thus to a large extent determines the content and timing of the mother's entry; this "leadership" is possible both because the baby has certain signalling mechanisms, and because the mother closely monitors, interprets and responds to these signals. In contrast, the instructional situation is defined by the mother's predetermined intent to bring about some particular result; she is therefore probably much less reliant on the direction of the baby's gaze as a signal to determine either the content or the timing of her own role. Further, because she has a specific outcome in mind, it might be assumed that she would be very concerned with his actions with the toy. For both reasons, it might be expected that, first, fewer of her own looks would be directed toward the baby's face than in a play situation, and second, that these looks might have a different purpose, with an emphasis on monitoring affect rather than interpreting content. It might also be expected that the mothers would be less dependent on determining the baby's focus of interest for regulating her verbal behavior.

Communication Patterns in Babies and Mothers

In terms of visual orientation, both groups of babies demonstrated far more interst in the toys than in their mothers or looking away. However, the nonhandicapped babies were relatively more engrossed with the toy, while the handicapped babies looked for shorter durations at the toys and for longer durations at their mothers. At 24 months, while the overriding interest in the toys remained, the handicapped babies changed direction more frequently, and looked away considerably more than at 12 months, resulting in less difference between the directions of looking. The two groups of babies in general became less similar in their looking behavior as they got older. Overall, the results of these analyses support what Jones found with respect to referential looking in DS babies (1977; 1980). Like the babies in Jones' study, these babies did not make full use of referential looking to incorporate their mothers into their ongoing attention to the toy; rather, their longer looks indicate a change in focus of attention. Looks away also tended to occur more frequently in the handicapped group, and to last somewhat longer as well; the handicapped babies may have been more easily distracted by events external to the toy play situation, and/or may have had a greater need to modulate the emotional arousal associated with interactive situations (Field, 1981). Situational comparisons, however, indicate that the former explanation is probably more valid. In their vocal behavior, both groups of babies talked much less than they were quiet, and fussed very little; at 24 months, they had a higher frequency of talking, and thus talked for more of the interaction time. There were no differences between groups.

It should be noted that the handicapped babies were developmentally delayed in comparison to the nonhandicapped babies (Table 1). The ability to combine two focuses of attention into the same interaction and to switch easily from one to the other have been found to be age related (Adamson & Bakeman, 1982), and to occur later in DS than in nonhandicapped babies (Bricker & Carlson, 1980). The handicapped babies, once they looked at their mothers, may have been less able to hold the toy in mind, and/or may simply have been captured by a more social stimulus (the face). A further factor may be that, if he is less able to independently explore the toy, the handicapped baby may more quickly lose interest in it. Gaze may thus reflect the depth of the baby's involvement with the toy. It seems unlikely that these differences are solely due to developmental immaturity, for in the study reported by Jones (1977; 1980), babies were matched for developmental rather than chronological age. Further, using longitudinal data from the present project, it has been possible to more closely match the DA's of the same babies included in this report by comparing 12 month data for nonhandicappped babies to 18 month data for handicapped; the results resemble those reported here.

Regardless of why they occur, these differences in looking patterns have important implications for their communicative value. First, shorter looks at the toy limit the time span during which the mother may establish joint attention to the toy and elaborate on the baby's action; her verbalizations therefore have less chance of being referentially obvious to the baby. Further, because the length of looks at the mother indicate a change in focus of attention, they may not serve as a turn-yield with the toy as content, but rather may signal to the mother a change in content, again making it harder for her to become a part of the baby's toy play. It may therefore be harder for the mother of the handicapped baby to use the baby's gaze to structure either the content or the timing of her entry.

The handicapped baby may not only limit his own exploration of the toy, but his mother's ability to expand on that exploration. By 24 months of age, the handicapped babies seem to have become less toy oriented, looking away instead. Looks at their mothers were still longer in duration than those of the nonhandicapped babies, indicating that problems with referential looking also probably still existed.

It is to be expected that mothers' communicative behaviors will reflect adjustments which accommodate their young partners. Further, when groups of babies differ in their interactive patterns, it is to be expected that their mothers will differ as well, and that they will differ in ways which reflect adjustments to (or problems in adjusting to) their babies. Mothers of these babies also looked most at the toys. Unlike their babies, however, they looked back and forth equally frequently between their babies' faces and the toys, indicating that their engrossment was not with the toys, but rather with their babies' actions and reactions to the toys. By doing so, the mothers would be able not only to monitor the baby's interactions with the toy, but would be able to regulate their own entry into the situation; further, more frequent and longer looks at his face would frame his much fewer and briefer looks at her, creating social moments within the toy play. Mothers also differed from their babies in their patterns of vocalizations, with very similar episodes and total amounts of talking and silence. The mothers' role was thus not one of simply monitoring, but of active participation.

While these patterns were generally apparent in each group, they were more characteristic of mothers of nonhandicapped babies. Mothers of the handicapped babies divided their looking much more evenly, looking for longer episodes at their babies' faces and for shorter episodes at the toys. At 24 months, these mothers took shorter and more frequent looks in each direction, and like their babies, had become less toy oriented and more face and away oriented. In terms of verbal behavior, at 12 months the mothers' episodes of talking were considerably longer than episodes of silence, while in the mothers of the nonhandicapped babies the episodes were more nearly equal, and also balanced in the opposite direction. At 24 months, there was more frequent talking in both groups of mothers, but in the mothers of handicapped babies the episodes had decreased in length; the mothers were much more similar to each other than at 12 months. Although the mothers of the handicapped babies still talked a bit more, there was no significant group difference. It is clear that, while the mothers were similar overall in their monitoring and participating roles, mothers of the handicapped babies tended to (a) match the differences in their babies in terms of being more face and away oriented, (b) exhibit more concern with monitoring their babies' faces, and (c) take a more active verbal role. The latter tendency has been noted by other researchers (Cardoso-Martins & Mervis, 1981; Greenberg, 1971).

Differences between the two situations also reflect the match between mothers and babies. In the instruction situation, babies changed directions of looking less frequently, becoming more visually oriented to the toy, looking at their mothers and away less. Similar patterns were found at both 12 and 24 months, although situation differences were smaller at 24 months. Babies also vocalized less frequently and for shorter episodes in instruction. In relation to total durations of looking in the three directions, both groups of mothers matched situational differences in their babies. However, while mothers of nonhandicapped babies matched their babies in frequency and mean duration patterns as well, mothers of the handicapped babies changed directions more frequently in instruction, with shorter episodes. This was evident to both age levels. At 12 months, but not at 24, mothers of the handicapped babies also had considerably longer episodes of verbalizing in instruction than in play.

Why might babies be more attentive to toys in an instructional situation? Conversely, why might they look less at their mothers? First, the mothers, through their active participation, may be making the toy more interesting, expanding its possibilities beyond what the baby could have discovered alone. Second, in a situation in which a mother spends less time looking at her baby's face, she will be less likely to see his look and respond to it; his looks may therefore have less communicative value in terms of his affecting her entry. Thus, the turn-yeilding function of a look may not be as important; the mother's turn is, by definition, more related to her own intent and to his response to her instruction than to his look. If the baby is handicapped and 12 months of age, the present results also indicate that the baby may have less need to visually monitor her presence in the instruction situation; instead, he can monitor aurally.

The results thus indicate that looks do not serve identical functions in maintaining the flow of interaction in the two types of situations. In instruction, the baby may have less need to look at the mother to monitor, to signal, or to obtain an active response, and when he does look, less chance of gaining the same type of respone as in play. Differences in gaze patterns in the two situations therefore closely match the adjustment of roles which might be expected in these two types of situations. In comparing results for mothers to those for their babies, it seems apparent that for mothers of the nonhandicapped babies, the primary source of information needed to maintain the interaction (i.e., the baby's face of the toy) differed in the two situations; when she is teaching, her primary source of information is the baby's response to her instruction, rather than his face. It might be assumed that the handicapped baby's actions with the toy are not as predictable in terms of how long they will last (as indicated by his gaze patterns); his actions with the toy also may not yield as much information to her in relation to her instruction. It may also be that if the mother is less able to obtain information on "engrossment" from watching the baby's actions, she may have more need to monitor his affective response to instruction. It appears that the mothers of the handicapped babies were exeriencing more uncertainty as to the babies' response to their instruction, and were trying to maximize their information by using both sources in both situations, rather than being able to use primarily one or the other. When she is instructing, the mother is less reliant on the baby's face for directing her own actions; her concern is with her own intent, and both the baby's actions and his face contain important information related to this intent. In addition, the baby is more visually attentive to the toy with instruction, giving the mother more chance to create this cycle. In both situations, the mother's major role seems to be one of monitoring the baby's focus of interest, including his actions, his focus of attention and his affect. In each group, mothers thus seemed to be using the sources of information which were most useful to their own roles in each of the two situations in relation to the capabilities of their babies.

It seems possible that both the apathy and the directiveness often noted in parents of handicapped babies may be related at least partly to the information that the mothers receive by watching their babies. With less clear feedback, it becomes unclear how one should proceed...hence the apathy. However, if one wants an interaction to occur when it might not naturally do so, adding one's own intent into the situation at least gives it a "topic"...hence the greater verbal activity. Even in "play", and especially at 12 months, the mothers of the handicapped babies may be "teaching" because it is more successful than play in focusing the handicapped baby's attention on the toys, and further, the mother does not have to depend on the baby's attention to the toy and on referential looking to establish her own role in the interaction. If the baby's cues are unclear, it seems very natural that the mother would add her own content and determine the timing of her own entry, attempting to establish complementary roles by whatever means might work. Maternal directiveness may thus be a natural adaptation to particular kinds of differences in the interactive partner.

Communication Patterns in Dyads

In general, dyads were characterized by the babies' attending visually to the toy while their moms alternately talked and were quiet. This was accomplished by a combination of mutual visual oriention to the toys and baby attention to the toys while their mothers watched their faces, along with vocal states in which the babies were quiet while their mothers interjected verbal comments. Within these general patterns, however, interaction occurred in different ways in relation to age, group and situation.

At 12 months dyads with handicapped babies were characterized by relatively less mutual orientation to the toys, by more of the states in which the baby looked at the toys while the mother watched his face, and by states involving more mother talk. These relative differences between groups were similar across situations. At 24 months, dyads with handicapped babies were still characterized by less mutual orientation to the toys; however, they now also engaged less in the states in which mother vocalization accompanied looks at the toy. This also was consistent across situations. One of the clearest indications that the situations affected the dyads differently was in the frequency of occurrence of the two most common visual states, TT and TF. Not only did the handicapped dyads engage in more TF in general, in the instruction situation they also alternated more frequently between the two states than in play, while the nonhandicapped dyads did not. Again, this was found at both age levels.

In general, these different dyadic patterns in the groups and situations reflected differences in one or both of the individuals. In some cases, however, an even closer relationship existed in particular combinations, and further reflected differences between the two groups of dyads in the two situations. In the states describing visual orientation of the two partners, mutual gaze, while seldom occurring, occurred together more than would be expected in both groups and in both situations: when one partner looked, the other was likely to be looking as well. And when the baby looked away, the mother was likely to monitor by also looking away or watching the baby's face or body. In general, more independence between partners was found in the nonhandicapped dyads, in the instructional situation, and at 24 months of age. Further, when predictable relationships were one-way, they more often illustrated that the baby influenced the mother rather than vice versa. Analysis of transitions between states at 12 months indicated clear cycles of looking behavior in the nonhandicapped dyads; cycles were more predictable for both groups in the instruction situation.

In vocal/vocal states, only states related to baby fussing showed predictable relationships at 12 months. At 24 months, predictable relationships in both play and instruction showed that the dyads with nonhandicapped babies typically alternated vocalizations, with less mutual silence and less mutual talk than would be expected. Dyads with handicapped babies, in contrast, showed no predictable relationships in instruction, while patterns found in the play situation indicated that this might be a particularly problematic one: alternating vocalization occurred less than expected, while mutual talk and silence occurred more. Furthermore, these relationships tended to be two-way.

States combining baby gaze with mother vocalization also showed group and situation differences. The nonhandicapped dyads were characterized by independence between these two: in this combination, neither individual was influenced by the other. Dependencies in the handicapped dyads again indicated that mutual regulation in this group may have been harder to accomplish; further, there were indications that mothers may not have been able to take as full advantage of the babies' looks at the toys to enter the interaction. In general, mother vocalization tended to be related to looking away, while silence was related to looking at the toy. It seems very likely that the differences in monitoring found in the two groups of mothers may indicate an attempt on the part of mothers of handicapped babies to keep tabs on their affective response to her vocalization during his episodes of toy engagement. Similarly, her longer durations of vocalizing during his looks at the toy (especially in instruction) at 12 months may indicate that she is trying to get as much in as possible before he looks away. By 24 months, she seems to have learned that this is somewhat counterproductive in terms of keeping the baby interested in the toy.

It is quite clear that the gaze and vocalization patterns of mothers and their babies are combined in very non-random ways. While dyads in the two groups were more similar than not, it is also clear that mechanisms which helped to regulate these interactions (e.g., monitoring, matching, framing, turn-taking) did not work in the same ways in the two situations, nor did they work equally as well in the two groups. Many of the differences in mothers and in dyadic combinations reflect obvious and very natural adjustments to differences in the babies. Not all of these adjustments, however, were adaptive in the sense of contributing to maintaining the interaction. One major implication of these results is that "teaching" situations may represent a kind of general adaptation which not only captures the handicapped baby's attention and seems to help him regulate his own behavior (thus becoming more predictable), but probably improves the quality of his actions with the toys as well. Further, because the mother is somewhat more independent in regulating her own behavior, instruction is probably more comfortable. Even this amount of independence, however, was clearly not of the type achieved in the dyads with nonhandicapped babies. While the roles of the mothers in each group were clearly more regulated by their babies' behavior than vice versa, mothers of the handicapped babies had the dual problem of having to regulate to an even greater extent with less predictable cues for doing so.

While creating instructional situations from play may be a natural adaptation, consider the possible consequences for the handicapped baby. It seems obvious that different types of learning occur in the two types of situations. Play provides a context for learning the rules of social interactions, for obtaining referentially obvious information, and for using the mother as a resource for self-directed learning; each of these is important for cognitive, language and affective development (Bruner, 1975; Cross, 1978; Newport, Gleitman & Gleitman, 1977; Ratner & Bruner, 1977; Schaffer, 1978). In instruction, babies learn to follow directions, attend to aspects of the environment that are important to others, and gain information and skills that they may not have discovered on their own; these aspects of instruction seem particularly important when the baby is handicapped. However, by limiting the range of situations in which he is engaged, the handicapped baby may effectively limit his own opportunities for different types of learning. Further, if a majority of the handicapped baby's interactions with toys occur in an instructional setting, he may not learn to use the wider range of looking patterns which will serve him in a wider variety of spontaneous learning situations.

It should be stressed that the looking patterns of the two groups of babies were more similar than not. However, results indicate that this similarity may diminish with age. The results of this study suggest that not only should patterns of looking be recognized as a potential problem area for any particular dyad in whch one member is a handicapped baby, but that intervention might usefully be directed toward (a) helping the mother to incorporate more characteristics of play into her interactions with the baby, and (b) helping the handicapped baby learn to use gaze in a more communicatively functional manner. For example, the mother of the handicapped baby may have to learn very early to carefully and consciously observe the baby, responding to looks as if they were an indication of interest, even if she is uncertain. Or she might have to direct the handicapped baby's attention to the toy, and then elaborate on his look. She may have to consciously respond to a look at her face as if it were a query about the toy, and then immediately direct the baby's attention back to the toy by performing an interesting action with it herself. For the individual handicapped baby/mother dyad, play may be a crucial area for intervention, with the goal of teaching looking patterns that will allow play and instruction to differ from each other and thus facilitate the learning of a broader and more adaptive range of responses.

Results of both the analyses of videotapes and of the more general scales leave the impression that what is demanded of mothers of handicapped babies amounts to super-parenting behavior; while interactions between nonhandicapped babies and normal parents occur very naturally, with little effort, and in a variety of situations conducive to a variety of beneficial developmental outcomes, these results demonstrate that such is not the case where the baby is handicapped. Another very important generalization is that when differences are found between parents (or others) interacting with babies possessing different characteristics, these differences may represent adjustments made in order to maintain the interaction. However, it can not be assumed that these adjustments are adaptive either for obtaining interaction or for further development.

Using the information collected in this 3-year project, much additional analysis will be directed toward describing and interpreting these processes of regulation and adaptation. While this report has dealt primarily with gaze and vocalization, and primarily in isolation from each other, interaction involves other modalities as well, and occurs in clumps of combined modalities. Further, communicative patterns must be related more clearly to the contexts in which they occur.

CHAPTER 3

SUB-STUDY 2: INDIVIDUAL CASES

Procedures and types of data collected for Sub-study 2 were very similar to those in Sub-study 1. The purpose of this second sub-study was to more intensively analyze the interactions of a smaller number of individual dyads in order to explore the development of individual differences in social interaction and their relation to the infant's environment. Data collection methods such as interviews and narrative accounts were therefore used in addition to the videotapes and rating scales.

Seven dyads, including 5 with handicapped and 2 with nonhandicapped babies, were observed at 1-2 month intervals from the time of identification (which ranged from 3-11 months of age) until their 36th month birthdates. Characteristics of this sample are presented in Tables 62 and 63. The first two dyads in the table are those whose data will be reported here. These two were selected because they were the youngest to enter the project (and hence more data were available), and because their families represented some very interesting contrasts which seemed to be related not only to the types of interactions in which they were involved, but to each baby's individual developmental progress.

For the present discussion, data were primarily selected from every four month interval, beginning at four months of age and ending at 36 months.

FAMILY INFORMATION

Dyad H

H, a Down syndrome male, entered the project at three months of age, after being referred by a local infant intervention program. He was

Table 62
Characteristics of Sample of SubStudy 2

				6-Month Bayley *		12-Month Bayley		18-Month Bayley		24-Month Bayley		30-Month Bayley/Binet +		35-Month Bayley/Binet	
Subj.	Primary Diagnosis	Age of Entry	Gender	Mental	Motor	Mental	Motor	Mental	Motor	Mental	Motor	Mental	Motor	Mental	Motor
HC201	Downs Syndrome	3	M	5.5	5.5	12.0	8.0	16.0	10.0	18.0	12.0	23.0	16.0	24.5	20.0
HC202	Visually Impaired	7	M	---	---	14.0	12.0	21.0	20.0	>30.0	27.5	>30.0	----	49.0	----
HC203	Multiply Handicapped	10	F	---	---	8.0	7.5	15.0	11.0	20.0	17.0	27.0	23.0	>30.0	30.0
HC204	Visually Impaired	6	M	6.0	6.0	11.0	11.0	14.0	19.0	19.5	23.0	23.5	24.0	>30.0	27.0
HC205	Downs Syndrome	2	F	5.0	4.0	9.0	6.0	----	----	----	----	----	----	----	----
HC206	Quadraplegic	14	M	---	---	---	---	----	----	----	----	----	----	----	----
HC207	Downs Syndrome	5	M	5.0	4.5	8.0	6.5	11.0	11.0	----	----	----	----	----	----
NHC251	Normal	2	M	8.0	7.5	16.0	11.0	23.0	20.0	>30.0	29.0	44.0	----	47.0	----
NHC252	Normal	6	M	7.0	7.0	15.0	15.0	19.0	16.0	27.0	25.0	31.0	----	49.0	----
NHC253	Normal	7	F	---	---	15.0	11.0	24.0	25.0	>30.0	23.0	32.0	----	43.0	----

*: The scores are age equivalents (in months) of the raw scores. Age equivalents were used since many of the handicapped subjects fell below the norms on the developmental indexes.

+: The Binet was given to those subjects who passed all or a majority of the items at an earlier age.
had passed all or a majority of the items by 24 months

Table 63
Family Characteristics of Subjects in SubStudy 2

Subj.	Birth Order	Number of Children	Number of Parents	Age of Mom at Birth of Subj.	Race	Education of Mom +	Family Income
HC201	3	4	2	27	White	2	5-10,000
HC202	2	2	2	27	White	2	20-25,000
HC203	2	2	2	28	White	4	20-25,000
HC204	2	2	2	25	White	2	5-10,000
HC205	2	2	2	23	White	2	10-15,000
HC206	2	3	2	25	White	4	15-20,000
HC207	3	3	2	30	White	4	>30,000
NHC251	1	2	2	27	White	4	5-10,000
NHC252	2	2	2	31	White	4	25-30,000
NHC253	2	2	2	36	White	3	>30,000

+:Education of Mom 1=less than high school diploma, 2=high school diploma to some college, 3=Junior College or technical degree, and 4=college or advanced degree.

full-term, with no birth complications, and mother and baby left the hospital five hours after birth. His health throughout the length of the project was good. H had two older brothers, with the three children being spaced about 2 to 2½ years apart; when H was about 30 months, a third brother was born. Both mother and father were in their late twenties. The father had a master's degree, while the mother had finished two years of college.

The most unusual factor in this family's life, and one which pervaded every aspect of their thinking and daily existence, was their involvement in an evangelistic religious group. They had moved to the community for the express purpose of being a part of and spreading this movement. The beliefs of this group dictated not only the roles of family members, but the schooling which children received and the friends with whom they played. "Simple living" and "back to basics" best describe the lifestyle related to these beliefs. Both mother and father were quiet spoken and gentle.

The father was the sole wage earner, with income derived from a small home maintenance business engaged in with other male members of the religious group. The father thought of his primary occupation as "evangelist." Famiy income was less than $10,000 per year. The mother, as all women in the group, was strongly committed to being a housewife and mother. In addition to the usual roles involved, however, this mother also taught school, for the group did not believe in sending its children to public schools. Within their very small house, part of the parents' bedroom was set up as a "school," and formal lessons were taught much as in a one-room school. Each boy, including H, participated from the very beginning. The mother took her role very seriously, and was an excellent and creative teacher. In addition to this schooling, and incorporated within it to some extent, were the activities suggested by H's home teacher from the infant intervention program. At the beginning, these consisted of motor and physical development activities, and later, of language activities. The mother, however, read widely, and went far beyond what the program had to offer. The language activities provided a good example of this, for she began sign language with H when he was about 16 months old, using formal teaching sessions as well as encouraging signing by all family members throughout the day. While the family thought of H as "special" in every sense of the word, he was treated much like the other children, and was often to be seen playing out in the yard or running around the backfield while his oldest brother played soccer. In terms of social life, H was truly part of an extended family network, and interacted actively and regularly with other children and adults in the religious group.

Participation in neither the research project nor in the infant intervention program were in line with the religious beliefs of this family. However, the parents felt strongly that not only should they learn all they could about H, but that other children like him would benefit from knowledge gained from their participation in research. The mother has become very active in a parent-to-parent program provided to new parents of handicapped infants.

Dyad B

This dyad entered the project when the baby, also a male, was two months of age, and was referred through a personal contact. The family was similar in many ways to that of Dyad H, with both parents being in their late twenties and college educated. Income in this family was also less than $10,000, being earned by the father from an assistantship obtained while working on his master's degree. The mother did not work outside of the home, believing strongly in the importance of her role as a mother. Like Mother H, this mother was very interested in infant development, and spent much time interacting with B. Another similarity to Dyad H was intense involvement in a religious community (Ba'hai). While this religious group was more intellectual than evangelistic, it nevertheless offered a similarly strong support group, and much of the social life of the family occurred with other members. A major difference from Dyad H was that B was the first child, with a younger baby girl being born when he was about 24 months of age.

Another major difference between the dyads was the very intense level of involvement of this mother with her son, probably due to a combination of factors including B's being the first child, the amount of time which the dyad spent alone together, and the emphasis which she placed on intellectual development.

IMPORTANCE AND CONDITIONS OF PLAY SESSIONS

At all nine age levels, mothers in both dyads consistently rated mother/child play as being extremely important for social and cognitive development. While B's mother also consistently felt that mother/child play was important for trying new activities and learning about new toys, by about 12 months, H's mother rated this purpose as only about average in importance, possibly reflecting either the influence of his two older brothers in helping to fulfill both of these functions, or that H's toy preferences had shown less change.

It is particularly interesting that B's mother felt that most of the games she played with him were "purely for fun", and that she never engaged in planned activities. She consistently reported that B most often chose the activities in which they engaged, while she used games suggested by "professionals" less than average. It was the perception of the research staff that she most often engaged B in interactions which she felt, from her reading, would further his cognitive development. She also invariably picked up on whatever activity had been planned for videotaping. It seemed obvious that she perceived his willing, active, and usually pleasurable participation as "play", and in fact, his responses very much controlled the course of their interactions, regardless of her initial intentions. Somehow "purely for fun" and "activities that are good for development" were blended into "play" sessions which B directed and which his mother did not perceive to be planned.

H's mother, in contrast, more clearly separated "play" and "planned activity," reporting that H was often engaged in planned activities, with the amount of time decreasing steadily as he got older. Very consistent with this was her perception of the proportion of parent/child games which were H's choice as compared to those suggested by a professional: the former increased steadily with age, while the latter decreased. For this dyad, planned activities occurred both in fairly structured situations and throughout the day, while play occurred spontaneously throughout the day rather than in specific time periods. H's mother felt that she engaged in parent/child play that was "purely for fun" a little less than average, whereas she felt that play engaged in for "learning specific things" occurred much more than average until H was 32 months, and then decreased to average by 36 months. In this dyad, play and teaching were thus perceived as being separate, even though both were seen as important for development and were often mother-directed. In Dyad B, in contrast, both were perceived as "play," i.e., of being one and the same, and were seen as more often being child-directed.

As might be expected simply from the number of people available to the two babies, the 24 hour diaries showed that H consistently engaged in more play-time than did B. In addition to play, H also (except at 36 months) was engaged in planned activities between one and six times per day. H's mother reported that she herself played with him in short sessions of 6-10 minutes in length, occurring 2-4 times per day at 4 months, and then once per day at the other age levels. The father's play with H showed a similar pattern. Play sessions with his siblings, on the other hand, occurred 2-4 times per day until 28 months, and then gradually increased to more than six times per day by 36 months. Play with children other than his siblings occurred fairly consistent at about once per week.

B's play sessions with his mother tended to occur somewhat more seldom (at least initially), staying at 2-4 sessions per day across all age levels, but lasting longer (15-30 minutes) than sessions between H and his mother. B's sessions with his father were also longer, but in contrast to H, these sessions occurred once per day at 4 months, and then increased to 2-4 times per day. Also in contrast to H, B's mother reported a gradual and consistent increase in the number of times that B played with children who were not part of his family.

CHARACTERISTICS OF PLAY

Child H

At 4 months of age, H's mother reported that what he liked best was people...being talked to..."While he doesn't laugh yet, he smiles all over." He also liked watching faces and bright colors. His mother stated that while he did not like tickling, he did like rough-housing. She also stated, however, that they did not rough-house as much with H as they had with their older boys. "He is different." At that age, toys were used primarily for teaching skills in tracking, reaching and turning to sound.

At 8 months, H still liked people and lots of attention, and his favorite games were "personal" ones with family members, particularly with his mother. Peek-a-boo, patty-cake and singing games were particular favorites. His mother also engaged him in "release and grasp" activities and in "pulling to sit." The latter he particularly disliked, but could be distracted so that he would participate. As for toys, he could now pick things up and transfer hands, and liked toys that he could bang and pull; he did not like toys which he could not pick up. By 8 months, he also liked being tickled, and according to his mother, was more responsive to touch than to any other avenue of interaction. One of this brothers typically engaged him in rough and tumble games, while the other used books and toys. With non-family members, H was "cautious and sober."

Up until about 12 months, his mother played with him more than did other family members. By this age, his brothers had begun to play with him about an equal amount. He now liked repetitious sound games, surprise sounds, and looking in the mirror. Turn-taking games were his favorites...rolling the ball, dropping things in a bucket, "talking" (imitating sounds). By 12 months, A was laughing and clapping and had begun to anticipate the next tickle. Touch was still the avenue to which he was most responsive, as it had been at 8 months. Motor activities, which his mother did with him throughout the day, were his least favorites, although he still very much liked rough and tumble play with his father and brothers.

At 16 months, "talking" was still one of H's favorite games with his mother. He would imitate sounds, point to family members, and look at books. Songs were also still a favorite. With his brothers, he most often engaged in wrestling or "cars." His mother reported that her own play with him had more of an instructional character than did that of the others. He was still cautious with non-family members. At this age, he had become most playful in response to sound or touch, and liked body movement games least.

By 20 months, H's mother reported that he liked to do things on his own, and that although with her he played signing games, turn-taking, reading and piano, he did not like to sit still. He was losing interest in turn-taking, wanting to do it all himself rather than watch her take her turn. The toys he liked best were colors and pencils, books and "mechanical" toys such as shapes and blocks. His favorite games, however, were pure social interaction...chase and water play. He enjoyed his brothers, but become frustrated with them. At this point, H could identify some body parts, had begun to imitate many signs, and used one sign ("papa") expressively.

At 2 year of age, H's favorite game was water play...in the toilet. He could now walk holding on to a wagon or bars. Whereas his mother had assumed even more of the "teacher" role, others were engaging him in rougher types of play, and H would initiate wrestling games with his brothers. His favorite toys were cars and trucks, colors and chalk. His least favorites were puzzles and shape sorters; he tended to like instructional games least in general.

By 28 months, these preferences were even clearer...he liked best what his brothers did with him, and was least pleased with "anything in one spot," such as working puzzles; he was exerting much independence. Toys with which he could be actively involved were his favorites, while "watch' toys did not interest him at all. During instructional situations, his mother worked on walking, signing and identifying objects, but what he liked best with her were singing, imitating chores, and playing piano. "Showing off" was a general favorite.

At 32 months, H's mom reported that she was still the "teacher," while father and brothers played such games as chase, horsie and wagon. Kicking and running were favorites, as was "directing others". The most common play activities with his mother were taking walks, playing ball and playing on the slide, while instructional activities including naming objects (which he liked) and puzzles (which he didn't). Instructional time had become less common.

By three years of age, H was primarily and by choice an "outside" person, liking chase, soccer and sand play. He had many expressive signs, and was putting them together in short sentences. He also had a number of verbal words. While he liked books, he still did not like to sit and be quiet. Activities with mom included riding bicycles, reading and coloring, and H would with pride call attention to marks that he made on a page. Trucks, plastic horses and the See & Say were favorite toys, while the puzzle was the least favorite. The big change in H's life at 36 months was that two other adults were now involved in instructional activities with him, teaching him signing and beginning to work on verbalization. At 3, he also entered a 2-hour per week structured language nursery with a small group of other children.

Overall, H's preferences for different types of games indicated that while at the three earliest age levels he preferred more passive games involving watching and touching, he thereafter began to prefer more lively "conventional" and imitation games, and these remained among his preferred games. He also at 18 months began to enjoy listening games and toys which had multiple and moving parts. Exercise games and simple toys were consistently his least favorites.

As a social partner, H's mother consistently rated him as slightly above average in readability and responsiveness, and as becoming less persistent (becoming more "average") as he grew older. Except at 4 and 8 months, distractibility was rated as slightly above average. Turn-taking was rated slightly above average or higher at all ages. Ratings on qualities more directly related to cognition, as might be expected, showed a show but certain change across ages. H's mother initially rated him very low in intentionality, curiosity and anticipation, with each showing a gradual increase to above average at 36 months. Initiation also increased with age, but remained at less than average.

Child B

As a stay-at-home mom with her first baby, B's mother was very diligent and serious about her mothering role, spending almost all of B's waking hours taking him for walks, shopping, or playing with him. She read numerous books on mothering, volunteered for every research project related to infant development, and was in general determined to do everything possible to further B's cognitive development. This pattern continued throughout the project, abating only slightly when a new baby was born. When B turned 3, his mother had him tested for enrollment in a local program for gifted 3-5 year olds.

At 4 months, B's mother most often used simple toys (Happy Apple, yarn ball) and books with him. She reported that he liked grabbing objects, pulling to stand and bouncing and tossing. He would also "talk" to the mirror. While he was very interested in sounds, would locate and reach for objects by sound, and talked to his toys when he woke up, he would not engage in "conversation." Responses to social interaction were primarily bodily excitement and giggling, also with little talking. He was totally uninterested in "watching toys" such as mobiles, instead preferring those he could pick up. His favorite interactions involved bodily movement, while his least favorites were touching games such as "creep-mouse." When his father played with him, it was primarily peek-a-boo.

By 8 months, B was pulling to stand and crawling, and liked making noise with toys such as his zylophone. His mother was teaching him to "pat," and he would pat on the table on command. She was also working on cup drinking and turning pages in books, and was trying imitation games. They also played repetitious games such as "in and out" and "open and shut." His mother reported that B was a flirt, and would stare at people until they smiled at him. He also liked surprise and exploring games, but rough-housing was his favorite. Least liked were sitting and toys that didn't move or couldn't be manipulated.

By 12 months, B's mother reported that he would play alone. Games involving the two of them included activities such as books, blocks and phone, and more active games such as cars, dancing and playing peek-a-boo around a chair. Dancing was also the activity used most often by B's father. B's favorite games at 12 months involved movement, noise and silly sounds. Whatever the game, he wanted to participate. He had become tired of familiar toys. B now had three other neighborhood children to play with, and interactions consisted primarily of showing off toys and taking toys from the others.

At 16 months, B was into books and playing outside. His favorite toy was an alarm clock. Playtime with mom involved naming pictures, making animal sounds, using puppets and talking on the phone. He also liked to knock over mom's block tower. His mother reported that he liked to do many things, as long as he decided what it would be. At this age, B had some words and could identify body parts and some of his clothes. He liked to pretend, laughed at funny sounds, and his favorite word was "Why?" With his father, piggyback was the favorite game, while his babysitter engaged him in roughhousing. This age level was the first at which his father's play with him took a different form than that with his mother. At this age, he also liked to stand at the window and watch the world go by.

At 20 months, B's mother reported that she was still the one who played with him the most; she played with him "most of the time," reading, singing, doing rhymes (which he chose), counting, walking and talking, using puzzles and blocks, and playing hide and seek behind the curtains. His favorite games and toys were those that involved sound, preferably made or caused by him. With other children, his favorite activities were chase and using the scooter toy. When his father played with him, the favorite was "pretend" using stuffed animals, each with its own personality and voice. In general, B's mother reported that he wanted to participate, and disliked any activity in which he had a passive role.

By 24 months, B was "helping" in many everyday household activities, and initiating most of the large amounts of conversation that went with them. Play with mom most commonly consisted of songs, counting, letters, or looking at books. His mother reported that he had no favorite toys, preferring "word" games instead. He now had a small special friend with whom he played house and turn-taking. Play with his father consisted of being physical and telling jokes, while play with mom was more "educational."

At 28 months, B's mother reported that he wanted to do everything independently (e.g., pouring his own milk). He still played most with his mom, engaging in reading, singing, walks, telephone, pretend, and just plain "talking." He did not like "toys." With his special friend, he engaged in word games aned personal turn-taking games which they made up. He also "read" to his friend, but would not read to his mom. With his dad, play consisted of word games, songs, rough-and-tumble. Wrestling and jumping were also favorites.

By 32 months, B was for the first time playing with other children more than with his mom. This was probably due at least partly to the presence of a new baby, but B was also actively engaged in inviting other children to come play. Favorite activities were playing with friends, especially pretend, and engaging in large motor activities...tricycles, gardening, mowing, water play. Time with his mother was spent in household tasks (cooking, stirring, kneading..."anything that I do"), and in sitting and talking. He also liked hiding things, cutting and pasting, his bat and ball, and songs with his name in them. He did not like sitting still except for talk. With his father, he played rough and tumble, swam, and did math games.

By three years of age, B had developed a fascination with "things"... the typewriter, lock-and-keys, tying strings, the workbench. Activities with his mother were still mostly everyday activities such as shopping, cooking, reading or going to the library. A favorite activity was making up words to songs. He also played peek-a-boo with, and "read" to, his new sibling. As at 32 months, most of his play now occurred with his friend.

Overall, B's most preferred games changed from rough and tumble at 4 months, with "watching" being added at 8 months and conventional games (peek-a-boo) at 12 months, to "talking," which was thereafter his favorite type of play. Large motor toys and pretend games also became favorites at the last two age levels. Consistently the least preferred games were those involving simple toys. As a social partner, B's mother gave him very high ratings in readability, persistence and responsiveness. Distractibility ranged around slightly less than average. Ratings of H's level of curiosity changed from above average at 4 months to very high at other age levels. Ratings of anticipation and turn-taking were less than average at 4 months, and then ranged from above average to very high. Initiation consistently ranged around average, while intentionality ranged from average to high.

STYLES OF INTERACTION

As in Sub-study 1, videotapes were coded for each modality of interaction for each member of each dyad. For this report, results for the gaze and vocalization modalities will be reported for Dyads H and B at each of the age levels discussed in the previous sections. Data were treated in two different ways, each of which will be drawn upon in this discussion. These included: (a) frequency, duration and mean duration for each code in each modality at each age level for each individual; and (b) event lag analysis of dyadic gaze behavior, using combined data from 4 and 8 months as compared to combined data from 16 and 20 months.

Characteristics of Gaze and Vocalization From 4-36 Months in 4 Situations

Baby Gaze

As shown in Tables 64 and 65, Baby H (handicapped) tended to be more face-oriented than Baby B in all four situations and across age levels, as well as showing more variability between age levels. Both babies looked at their mothers more in the no toy situations than when a toy was used, but the difference between situations was greater for Baby H: Baby B instead looked away a good deal more. Each baby looked away less in the toy situations, but the difference was not as clear in Baby H as in Baby B. In the toy situations, each of the two babies was more toy oriented with than without instruction. However, while this difference was clear from the beginning in B, it became clear for H only as he grew older. In the toy instruction situation, B looked for longer episodes at the toys as he got older, while looks tended to get shorter in the no instruction situation. B looked more frequently at his mother's face as he got older, but became less variable across situations. H showed less variation across ages in toy orientation, but like B, looked more at the toy with instruction. Like B, he looked more at his mother in the no toy than in the toy situations, but overall showed less difference between situations: when there was a toy, he looked at that, and when there was not, he looked away. Thus, these two babies in general reflected the group and situation differences reported in Sub-study 1. B, the nonhandicapped baby, was the more toy-oriented of the two, while H was more mother-oriented. Instruction was especially effective with H in terms of increasing his toy orientation; B's toy orientation was greater in both toy situations.

TABLE 64

Baby Gaze: Handicapped Dyad

	NO TOY NO INSTR			TOY NO INSTR			NO TOY INSTR			TOY INSTR		
	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR
LOOK AT FACE												
4 MONTHS	38	6.69	59	30	3.50	16	54	24.57	96	22	2.20	6
8 MONTHS	54	6.09	78	15	3.29	13	6	2.00	2	36	5.29	41
12 MONTHS	38	5.06	51	50	8.56	76	48	4.92	68	20	1.78	9
16 MONTHS	42	5.00	56	0	0.00	0	46	3.41	42	6	1.00	1
20 MONTHS	40	6.41	61	27	1.92	14	39	5.94	59	22	2.25	5
24 MONTHS	42	11.15	81	32	2.55	16	40	6.89	69	38	2.75	12
28 MONTHS	48	6.93	58	46	2.80	23	21	3.56	18	29	2.25	10
32 MONTHS	42	7.46	54	48	3.40	38	53	15.70	87	44	3.86	15
36 MONTHS	44	8.86	69	45	3.00	28	50	5.59	68	27	1.25	3
LOOK AT TOY												
4 MONTHS	0	0.00	0	48	11.15	81	0	0.00	0	48	14.09	86
8 MONTHS	0	0.00	0	44	4.95	58	46	8.25	73	23	5.56	28
12 MONTHS	8	1.00	2	12	5.25	12	12	1.17	4	37	7.53	71
16 MONTHS	0	0.00	0	56	18.22	91	0	0.00	0	59	16.90	94
20 MONTHS	12	4.80	13	23	8.91	54	9	4.25	9	50	18.33	92
24 MONTHS	6	1.00	1	35	10.08	67	2	1.00	1	52	14.00	86
28 MONTHS	10	14.00	23	52	7.95	75	33	6.14	48	43	11.75	78
32 MONTHS	10	1.67	3	50	5.24	61	10	5.00	6	44	21.57	84
36 MONTHS	22	3.43	13	47	6.44	64	23	2.40	13	53	21.38	95

Table 64 (continued)

	NO TOY NO INSTR			TOY NO INSTR			NO TOY INSTR			TOY INSTR		
	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR
LOOK AT BODY												
4 MONTHS	24	2.90	16	0	0.00	0	38	1.40	4	0	0.00	0
8 MONTHS	21	1.33	7	6	4.00	7	9	1.33	2	0	0.00	0
12 MONTHS	25	1.83	12	28	2.11	11	25	3.08	22	37	1.94	18
16 MONTHS	33	2.25	20	0	0.00	0	10	1.60	4	0	0.00	0
20 MONTHS	21	2.22	11	33	1.75	16	24	1.45	9	6	1.00	1
24 MONTHS	26	1.50	7	12	1.75	4	29	1.54	11	0	0.00	0
28 MONTHS	6	3.00	3	0	0.00	0	5	1.50	2	4	4.00	2
32 MONTHS	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
36 MONTHS	9	1.67	3	0	0.00	0	0	0.00	0	0	0.00	0
LOOK AWAY												
4 MONTHS	29	2.75	18	18	1.20	3	8	1.00	1	22	1.60	4
8 MONTHS	23	2.60	14	33	2.50	22	40	2.86	22	28	3.91	24
12 MONTHS	29	4.50	35	9	1.00	2	15	1.25	6	6	1.00	2
16 MONTHS	23	3.91	24	44	2.29	9	44	4.62	54	35	1.67	6
20 MONTHS	26	2.45	15	17	3.63	16	28	3.08	22	22	1.25	3
24 MONTHS	26	2.63	12	21	3.43	13	29	2.69	19	10	2.00	2
28 MONTHS	36	2.55	16	3	3.00	2	40	3.18	30	25	2.43	9
32 MONTHS	39	5.83	39	2	2.00	1	37	1.86	7	12	1.00	1
36 MONTHS	25	3.38	15	8	4.33	7	27	2.75	18	20	1.33	2

TABLE 65

Baby Gaze: Nonhandicapped Dyad

	NO TOY NO INSTR			TOY NO INSTR			NO TOY INSTR			TOY INSTR		
	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR
LOOK AT FACE												
4 MONTHS	40	8.50	47	17	1.60	4	21	4.43	17	12	2.00	1
8 MONTHS	57	7.75	17	22	2.13	9	19	2.25	10	26	4.33	14
12 MONTHS	36	1.20	3	0	0.00	0	30	1.90	11	0	0.00	0
16 MONTHS	21	1.33	2	12	1.00	1	28	1.36	11	29	1.17	4
20 MONTHS	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
24 MONTHS	24	3.08	22	0	0.00	0	42	3.78	38	0	0.00	0
28 MONTHS	0	0.00	0	0	0.00	0	48	5.00	28	0	0.00	0
32 MONTHS	29	11.80	33	4	2.00	1	44	4.14	16	33	1.50	3
36 MONTHS	46	3.00	8	30	3.75	17	36	5.50	43	0	0.00	0
LOOK AT TOY												
4 MONTHS	16	3.25	7	43	11.15	81	0	0.00	0	50	42.00	93
8 MONTHS	0	0.00	0	47	8.76	83	0	0.00	0	39	14.78	74
12 MONTHS	0	0.00	0	53	15.67	78	0	0.00	0	100	180.00	100
16 MONTHS	21	1.67	3	53	16.78	84	0	0.00	0	48	16.80	93
20 MONTHS	36	11.00	31	57	20.00	89	12	1.00	1	100	180.00	100
24 MONTHS	28	2.07	17	56	35.20	98	0	0.00	0	60	59.00	98
28 MONTHS	50	42.00	23	50	178.00	99	0	0.00	0	100	180.00	100
32 MONTHS	0	0.00	0	52	12.83	86	0	0.00	0	58	24.71	96
36 MONTHS	0	0.00	0	53	10.44	52	0	0.00	0	67	89.00	99

Table 65 (continued)

	NO TOY NO INSTR			TOY NO INSTR			NO TOY INSTR			TOY INSTR		
	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR
LOOK AT BODY												
4 MONTHS	8	1.00	1	3	1.00	1	9	3.33	5	0	0.00	0
8 MONTHS	0	0.00	0	6	1.00	1	45	3.37	36	4	2.00	1
12 MONTHS	0	0.00	0	18	1.33	2	12	3.00	7	0	0.00	0
16 MONTHS	7	1.00	1	12	1.00	1	24	1.42	9	5	1.00	1
20 MONTHS	21	4.33	7	0	0.00	0	12	1.00	1	0	0.00	0
24 MONTHS	6	1.33	2	0	0.00	0	2	1.00	1	0	0.00	0
28 MONTHS	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0
32 MONTHS	29	7.20	20	0	0.00	0	0	0.00	0	0	0.00	0
36 MONTHS	0	0.00	0	0	0.00	0	5	2.00	2	0	0.00	0
LOOK AWAY												
4 MONTHS	32	9.88	44	27	2.25	10	53	7.22	72	38	3.33	5
8 MONTHS	43	49.67	83	25	1.33	7	31	7.15	52	30	2.71	11
12 MONTHS	64	19.33	97	29	7.00	19	39	10.00	72	0	0.00	0
16 MONTHS	50	24.29	94	24	6.25	14	47	5.95	79	19	1.00	2
20 MONTHS	43	18.67	62	43	3.33	11	75	29.67	99	0	0.00	0
24 MONTHS	42	4.77	58	44	1.00	2	56	4.63	62	40	1.50	2
28 MONTHS	50	138.00	77	50	2.00	1	52	11.82	72	0	0.00	0
32 MONTHS	41	12.14	47	44	2.40	13	44	18.43	72	8	1.00	1
36 MONTHS	54	27.50	92	30	6.13	27	31	5.67	38	33	2.00	1

TABLE 66

Baby Talk: Handicapped Dyad

	NO TOY NO INSTR			TOY NO INSTR			NO TOY INSTR			TOY INSTR		
	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR
BABY TALK POSITIVE												
4 MONTHS	35	2.69	19	33	2.00	1	45	2.11	11	0	0.00	0
8 MONTHS	47	2.22	11	27	2.00	7	41	2.57	10	50	3.33	17
12 MONTHS	48	2.93	23	50	2.08	15	50	2.64	16	40	1.50	2
16 MONTHS	52	2.17	28	50	2.16	30	41	3.65	53	53	2.48	34
20 MONTHS	48	2.65	34	49	2.08	28	44	3.65	47	48	2.07	16
24 MONTHS	52	2.65	38	47	2.40	20	37	2.39	24	50	2.29	22
28 MONTHS	50	2.60	29	50	2.13	18	49	3.35	32	52	2.93	47
32 MONTHS	52	3.26	42	50	2.70	34	54	3.09	55	55	2.50	39
36 MONTHS	53	3.00	28	47	2.69	24	51	2.56	25	45	2.43	19
BABY SILENT												
4 MONTHS	46	7.35	69	67	89.00	99	50	16.00	89	100	180.00	100
8 MONTHS	53	16.00	89	41	16.56	83	47	19.00	84	50	16.67	83
12 MONTHS	52	9.27	77	50	11.77	85	50	13.73	84	60	59.00	98
16 MONTHS	48	6.19	72	50	5.04	70	46	2.21	35	47	5.36	65
20 MONTHS	50	4.88	65	51	5.20	72	46	3.58	48	52	10.07	84
24 MONTHS	48	4.63	62	53	8.47	80	49	4.21	56	50	8.29	78
28 MONTHS	50	6.40	71	50	9.87	82	51	6.83	68	48	3.52	53
32 MONTHS	43	5.00	58	50	5.13	65	46	3.00	45	45	4.78	61
36 MONTHS	47	8.60	72	53	7.61	76	49	7.88	74	55	8.59	81

Table 66 (continued)

	NO TOY NO INSTR			TOY NO INSTR			NO TOY INSTR			TOY INSTR		
	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR
BABY FUSS												
4 MONTHS	19	2.86	11	0	0.00	0	0	0.00	0	0	0	0
8 MONTHS	0	0.00	0	32	2.71	11	12	5.00	5	0	0	0
12 MONTHS	0	0.00	0	0	0.00	0	0	0.00	0	0	0	0
16 MONTHS	0	0.00	0	0	0.00	0	13	2.63	12	0	0	0
20 MONTHS	0	0.00	0	0	0.00	0	0	0.00	0	0	0	0
24 MONTHS	0	0.00	0	0	0.00	0	14	5.14	20	0	0	0
28 MONTHS	0	0.00	0	0	0.00	0	0	0.00	0	0	0	0
32 MONTHS	0	0.00	0	0	0.00	0	0	0.00	0	0	0	0
36 MONTHS	0	0.00	0	0	0.00	0	0	0.00	0	0	0	0

TABLE 67

Baby Talk: Nonhandicapped Dyad

	NO TOY NO INSTR			TOY NO INSTR			NO TOY INSTR			TOY INSTR		
	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR
BABY TALK POSITIVE												
4 MONTHS	48	2.27	14	0	0.00	0	44	2.25	5	0	0.00	0
8 MONTHS	47	2.60	22	40	3.00	3	49	2.16	23	46	2.50	8
12 MONTHS	31	3.08	21	44	2.14	8	7	3.50	4	0	0.00	0
16 MONTHS	21	2.38	11	43	3.33	5	22	3.00	17	50	2.17	14
20 MONTHS	40	2.00	4	49	2.17	28	47	1.89	9	47	2.00	10
24 MONTHS	49	2.40	33	50	2.33	43	49	2.35	44	49	2.09	37
28 MONTHS	54	2.29	53	52	2.77	48	46	2.69	39	51	2.43	31
32 MONTHS	55	4.42	64	50	2.80	31	57	2.52	46	51	2.59	32
36 MONTHS	52	3.06	56	47	2.54	39	52	2.81	50	53	2.29	39
BABY SILENT												
4 MONTHS	52	12.92	86	100	180.00	100	55	34.20	95	100	180.00	100
8 MONTHS	53	8.29	78	60	58.00	97	51	6.95	77	54	23.57	92
12 MONTHS	44	4.00	33	50	20.38	91	26	2.43	9	100	180.00	100
16 MONTHS	45	5.47	52	57	42.50	94	44	3.00	33	50	12.83	85
20 MONTHS	50	34.00	94	51	5.42	72	53	16.30	91	53	16.20	90
24 MONTHS	51	4.62	67	50	3.12	57	51	2.86	55	51	3.42	63
28 MONTHS	46	2.40	47	48	3.24	52	50	3.64	57	49	5.64	69
32 MONTHS	45	3.10	36	50	6.20	69	43	3.88	54	49	5.86	68
36 MONTHS	48	2.63	44	43	3.24	52	47	3.10	50	47	4.04	61

Table 67 (continued)

	NO TOY NO INSTR			TOY NO INSTR			NO TOY INSTR			TOY INSTR		
	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR
BABY FUSS												
4 MONTHS	0	0.00	0	0	0.00	0	0	0.00	0	0	0	0
8 MONTHS	0	0.00	0	0	0.00	0	0	0.00	0	0	0	0
12 MONTHS	20	8.63	38	6	2.00	1	44	11.17	74	0	0	0
16 MONTHS	34	5.23	38	0	0.00	0	31	6.21	48	0	0	0
20 MONTHS	0	0.00	0	0	0.00	0	0	0.00	0	0	0	0
24 MONTHS	0	0.00	0	0	0.00	0	0	0.00	0	0	0	0
28 MONTHS	0	0.00	0	0	0.00	0	2	6.00	3	0	0	0
32 MONTHS	0	0.00	0	0	0.00	0	0	0.00	0	0	0	0
36 MONTHS	0	0.00	0	5	5.00	8	0	0.00	0	0	0	0

TABLE 68

Mother Gaze: Handicapped Dyad

	NO TOY NO INSTR			TOY NO INSTR			NO TOY INSTR			TOY INSTR		
	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR
LOOK AT BODY												
4 MONTHS	44	14.64	89	53	18.78	94	100	180.00	100	54	28.67	96
8 MONTHS	53	20.75	92	48	5.85	65	42	4.12	39	42	3.42	36
12 MONTHS	54	28.33	94	53	21.25	94	56	34.20	95	48	5.60	62
16 MONTHS	50	16.40	91	24	2.60	14	39	8.92	64	47	2.40	20
20 MONTHS	50	14.73	90	50	6.21	66	50	27.33	91	48	3.92	52
24 MONTHS	55	14.91	91	43	3.10	36	60	19.33	97	44	3.83	38
28 MONTHS	47	14.11	71	51	3.65	53	27	4.11	21	48	5.25	58
32 MONTHS	33	16.00	71	51	4.15	46	67	89.50	99	47	4.35	22
36 MONTHS	52	13.82	84	44	8.18	50	42	31.00	86	14	1.50	2
LOOK AWAY												
4 MONTHS	0	0.00	0	29	1.40	4	0	0.00	0	36	1.75	4
8 MONTHS	0	0.00	0	26	4.09	25	47	4.89	52	11	3.00	8
12 MONTHS	0	0.00	0	33	1.60	4	22	1.00	1	50	3.19	37
16 MONTHS	0	0.00	0	46	5.74	61	0	0.00	0	50	8.94	79
20 MONTHS	4	1.00	1	42	3.44	31	0	0.00	0	48	3.33	44
24 MONTHS	15	2.67	4	43	5.00	58	0	0.00	0	51	5.05	59
28 MONTHS	10	16.50	18	45	3.61	46	18	6.00	20	40	3.29	31
32 MONTHS	0	0.00	0	49	5.11	54	0	0.00	0	47	20.00	78
36 MONTHS	24	3.40	9	48	7.25	48	8	14.00	8	57	20.83	93

Table 68 (continued)

	NO TOY NO INSTR			TOY NO INSTR			NO TOY INSTR			TOY INSTR		
	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR
LOOK AT FACE												
4 MONTHS	32	1.25	6	0	0.00	0	0	0.00	0	9	1.00	1
8 MONTHS	27	2.50	6	5	2.00	2	5	1.50	2	16	1.86	7
12 MONTHS	18	2.50	3	13	1.00	1	22	3.50	4	2	1.00	1
16 MONTHS	30	2.00	7	17	4.57	18	39	3.92	28	0	0.00	0
20 MONTHS	18	2.50	6	0	0.00	0	8	3.00	2	0	0.00	0
24 MONTHS	5	1.00	1	4	1.00	1	20	1.00	2	0	0.00	0
28 MONTHS	37	2.57	10	0	0.00	0	46	6.60	55	10	4.00	9
32 MONTHS	42	3.90	22	0	0.00	0	33	1.00	1	7	1.00	1
36 MONTHS	19	2.50	6	4	2.00	1	17	2.00	2	0	0.00	0
LOOK AT TOY												
4 MONTHS	24	1.50	5	18	1.33	2	0	0.00	0	0	0.00	0
8 MONTHS	13	1.00	1	21	1.56	8	5	7.00	8	4	1.00	1
12 MONTHS	27	1.67	3	0	0.00	0	0	0.00	0	0	0.00	0
16 MONTHS	0	0.00	0	12	2.60	7	9	1.33	2	3	1.00	1
20 MONTHS	18	1.00	2	8	2.33	4	17	2.00	2	4	3.00	3
24 MONTHS	25	1.40	4	8	1.50	3	20	1.00	2	5	2.50	3
28 MONTHS	5	2.00	1	4	1.00	1	9	2.67	4	2	3.00	2
32 MONTHS	25	2.17	7	0	0.00	0	0	0.00	0	0	0.00	0
36 MONTHS	5	1.00	1	4	1.00	1	25	1.67	3	29	2.50	6

TABLE 69

Mother Gaze: Nonhandicapped Dyad

	NO TOY NO INSTR			TOY NO INSTR			NO TOY INSTR			TOY INSTR		
	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR
LOOK AT FACE												
4 MONTHS	52	14.91	91	50	15.70	87	48	6.60	73	54	18.71	73
8 MONTHS	48	5.56	49	50	9.47	79	43	17.33	87	45	6.93	54
12 MONTHS	39	5.56	49	47	4.07	34	41	12.89	64	40	1.50	2
16 MONTHS	36	8.73	53	44	5.91	36	42	4.25	47	44	4.75	32
20 MONTHS	38	13.60	38	48	5.64	34	46	10.67	71	44	2.75	6
24 MONTHS	58	7.39	74	47	2.86	22	54	13.75	92	48	3.62	26
28 MONTHS	0	0.00	0	31	2.30	8	44	12.08	81	0	0.00	0
32 MONTHS	52	10.15	73	33	3.40	19	44	10.14	39	47	2.13	9
36 MONTHS	43	13.78	69	28	13.60	38	35	20.17	67	11	2.00	1
LOOK AT TOY												
4 MONTHS	0	0.00	0	30	2.67	9	2	1.00	1	46	8.17	27
8 MONTHS	3	3.00	2	47	2.43	19	5	2.00	1	48	5.33	44
12 MONTHS	0	0.00	0	41	7.46	54	4	7.00	4	60	59.00	98
16 MONTHS	16	5.00	14	40	10.70	59	4	1.00	1	52	8.64	67
20 MONTHS	38	11.80	33	52	9.83	66	27	4.71	18	56	33.80	94
24 MONTHS	32	3.70	21	53	8.75	78	4	2.00	1	52	9.50	74
28 MONTHS	0	0.00	0	50	19.63	87	4	1.00	[illegible]	100	180.00	100
32 MONTHS	0	0.00	0	50	9.07	76	0	0.00	0	53	18.11	91
36 MONTHS	0	0.00	0	17	17.00	28	0	0.00	0	56	32.40	90

Table 69 (continued)

	NO TOY NO INSTR			TOY NO INSTR			NO TOY INSTR			TOY INSTR		
	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR
LOOK AT BODY												
4 MONTHS	48	1.60	9	0	0.00	0	45	2.37	25	0	0.00	0
8 MONTHS	36	7.00	47	0	0.00	0	43	2.11	11	0	0.00	0
12 MONTHS	46	4.37	46	3	13.00	7	36	5.88	26	0	0.00	0
16 MONTHS	29	5.44	27	0	0.00	0	27	5.54	40	0	0.00	0
20 MONTHS	23	17.67	29	0	0.00	0	19	3.00	8	0	0.00	0
24 MONTHS	10	3.33	6	0	0.00	0	9	2.00	2	0	0.00	0
28 MONTHS	50	7.19	64	12	2.00	2	33	2.78	14	0	0.00	0
32 MONTHS	32	5.25	23	17	2.00	6	50	13.38	59	0	0.00	0
36 MONTHS	48	4.00	22	39	6.00	23	35	3.83	13	22	6.00	7
LOOK AWAY												
4 MONTHS	0	0.00	0	5	1.00	1	5	1.00	1	0	0.00	0
8 MONTHS	12	1.00	2	3	4.00	2	5	1.00	1	6	1.50	2
12 MONTHS	12	1.40	4	9	3.00	5	18	2.50	6	0	0.00	0
16 MONTHS	19	1.67	6	16	2.00	4	25	1.58	11	4	2.00	1
20 MONTHS	0	0.00	0	0	0.00	0	4	1.00	1	0	0.00	0
24 MONTHS	0	0.00	0	0	0.00	0	32	1.29	5	0	0.00	0
28 MONTHS	50	4.06	36	6	5.00	3	18	1.80	5	0	0.00	0
32 MONTHS	16	1.50	3	0	0.00	0	6	2.00	1	0	0.00	0
36 MONTHS	9	8.00	9	6	6.00	3	12	2.00	2	11	4.00	2

Baby Vocalization

As seen in Tables 66 and 67, the two babies vocalized about equally frequently and for about the same proportion of the interactions, although they differed at the different age levels. Each baby also showed a slight tendency to talk more as he became older, and this was apparent in each situation. Baby B's episodes of talking also showed a trend toward becoming longer as he got older; in Situations 2 and 4, his silences conversely tended to become shorter and less variable across situations. The same trends were apparent in Baby H, but were not as distinct.

Mother Gaze

Both mothers spent more time looking at their babies in no toy as compared to the toy situations, and this difference became clearer as their babies got older (Tables 68 and 69). Both also looked at their babies more in no toy instruction than in no toy play. Both mothers also looked more at the toys during instruction, but this tendency was much more distinct in Mother B than in Mother H. As the babies got older, each of the two mothers looked more at the toys.

Within these similar patterns for the total durations of looking, Mother H looked at her baby's face a bit more frequently across the different age levels; the mean durations of these looks were extremely variable across ages, but especially when H was younger, remaining variable in Situation 3 across all ages. Mean durations of looking to H's face were, except at 4 months, consistently longer in the no toy situations.

B's mother, in contrast, was more consistent across situations in the mean durations of looking at B's face, although she also tended to look at him for longer episodes in the no toy situations. The length of her looks were also considerably more stable across age levels.

An opposite type of pattern was apparent in looks at the toys. While H's mother displayed extreme variability across ages in the mean duration of looks at H, especially in the no toy instruction situation, Mother B evidenced extreme variability across ages in the mean duration of looks at the toy, especially in the toy instruction situation (Situation 4). Mother H, in contrast, tended to look at the toy somewhat more frequently and for somewhat longer episodes in the two toy situations as H got older.

For both mothers, looks away were variable in frequency across ages, and occurred more in the no toy situations. Mother B showed more variability than did Mother H in the total duration of looking away across both situations and ages.

Mother Talk

As shown in Tables 70 and 71, the two mothers were very similar in their patterns of talking. Each talked about 50% of the time, and in the no toy situations, tended to talk a bit more than in the toy situations. H's mother did talk a bit more frequently than B's in the first months. Of the three measures, mean durations of talking (but not of silence) showed the only consistent variations. Situation 3 (no toy/instruction) tended to contain the longest episodes of mom talk. For both mothers, the length of talking episodes tended to get shorter as the babies got older, with some variation across ages: longer episodes were found in both moms at 20 months, and in H's mom in Situation 3 at 24 months. H's mother also had somewhat longer episodes of talking in Situations 1 and 3 than in 2 and 4; these became more equal in length with age.

Mother and Baby

Both babies looked at the toys more than their mothers did, while both mothers were more oriented to their babies' faces. A comparison of

TABLE 70

Mother Talk: Handicapped Dyad

	NO TOY NO INSTR			TOY NO INSTR			NO TOY INSTR			TOY INSTR		
	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR
MOM TALK POSITIVE												
4 MONTHS	55	7.10	83	51	3.64	57	51	2.78	56	50	3.52	49
8 MONTHS	52	5.29	71	53	4.00	67	52	2.80	39	52	5.67	75
12 MONTHS	52	5.91	75	50	3.57	59	52	4.36	68	50	4.64	64
16 MONTHS	49	3.74	64	51	2.81	58	50	5.65	72	50	2.67	44
20 MONTHS	51	6.43	75	50	4.33	65	51	5.57	71	51	3.70	55
24 MONTHS	49	2.97	53	49	3.03	59	50	8.41	79	47	2.38	38
28 MONTHS	53	1.86	60	56	2.50	67	53	2.87	61	53	2.00	51
32 MONTHS	54	2.35	63	52	1.46	45	51	2.02	57	52	1.60	40
36 MONTHS	51	1.56	54	50	1.76	49	51	1.88	58	43	1.66	28
MOM SILENT												
4 MONTHS	45	1.82	17	49	2.89	43	49	2.29	44	50	3.68	51
8 MONTHS	48	2.41	29	47	2.22	33	48	4.73	61	48	2.00	24
12 MONTHS	48	2.10	24	50	2.43	41	48	2.23	32	50	2.56	35
16 MONTHS	51	2.00	35	49	2.11	42	43	2.20	24	50	3.33	55
20 MONTHS	46	2.26	24	50	2.33	35	33	2.35	22	47	3.08	43
24 MONTHS	48	2.61	45	44	2.00	35	50	2.18	21	49	3.53	59
28 MONTHS	47	1.41	40	43	1.62	33	47	2.09	39	46	2.20	49
32 MONTHS	46	1.63	37	48	1.92	54	48	1.60	43	48	2.57	60
36 MONTHS	49	1.34	45	49	1.90	51	49	1.41	41	50	3.46	67

TABLE 71

Mother Talk: Nonhandicapped Dyad

	NO TOY NO INSTR			TOY NO INSTR			NO TOY INSTR			TOY INSTR		
	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR	% FREQ	MEAN DUR	% DUR
MOM TALK POSITIVE												
4 MONTHS	51	5.75	77	51	3.43	57	52	11.92	86	51	3.66	59
8 MONTHS	43	3.15	45	49	3.04	39	50	2.91	53	48	3.22	41
12 MONTHS	41	3.59	54	52	3.35	58	51	2.87	48	50	3.86	62
16 MONTHS	50	4.29	67	52	2.93	47	50	3.18	58	49	3.09	55
20 MONTHS	50	5.12	71	50	5.83	74	49	7.83	78	45	2.63	44
24 MONTHS	50	2.94	57	51	2.67	58	50	2.17	49	51	2.26	49
28 MONTHS	51	1.49	47	53	2.07	51	54	2.49	68	54	2.68	59
32 MONTHS	54	2.32	57	53	4.26	73	54	2.52	62	52	1.60	40
36 MONTHS	53	3.39	62	52	3.16	56	51	4.92	68	52	3.72	66
MOM SILENT												
4 MONTHS	49	1.83	23	47	2.68	42	44	2.09	13	49	2.64	41
8 MONTHS	45	3.07	46	47	4.82	59	48	2.56	45	50	4.33	58
12 MONTHS	37	2.25	30	47	2.46	38	47	3.32	52	49	2.28	37
16 MONTHS	46	2.15	31	46	3.58	52	38	2.40	33	48	2.42	42
20 MONTHS	48	2.08	28	50	2.00	25	43	1.94	17	44	2.93	47
24 MONTHS	50	2.20	43	49	2.00	42	50	2.22	51	48	2.41	49
28 MONTHS	49	1.73	53	47	2.28	49	46	1.38	32	46	2.15	41
32 MONTHS	43	2.17	42	47	1.78	27	46	1.82	38	47	2.61	59
36 MONTHS	47	2.34	38	47	2.72	44	49	2.38	32	48	2.03	34

profiles and trends within dyads, however, indicated a fairly close match between the gaze patterns of each mother and her baby. In Dyad H, mother and baby showed a similar tendency to look more at the toy as the baby got older. Further, the percent duration of looking at each others' faces had very similar profiles across ages in all situations except 4. The mean durations of looking at each others' faces had similar profiles in all situations except 1. Situation 3 resulted in especially similar profiles for both duration and mean duration of looking at each others' faces. Amount of looking away also had similar profiles, even though Mother H looked away much less than Baby H. Profiles for mean durations of looks at the toys became more similar for Dyad H at the later age levels.

Like Dyad H, Dyad B's gaze profiles were also most similar in Situation 3. While "look at face" profiles were less similar than in Dyad H, "look at toy" profiles for total duration were very similar. Mean durations of looks at the toys in both Situations 2 and 4 showed almost identical peaks and valleys across age levels, and mean durations of looks at each others' faces matched in profile in all but Situation 1. Unlike Dyad H, profiles for looking away showed no resemblance to each other: Mother B did very little looking away regardless of whether her baby was or not.

Profiles for the vocalization modality did not show the same type of match between the two members of the dyads. The two mothers talked more than their babies did, and showed considerably less variability across ages and situations. Baby talk tended to increase with age, while mother talk decreased slightly in mean and total duration. Thus, in the case of vocalization, the match seems to have been more in the form of an inverse correlations.

Sequences of Dyadic Gaze States: Lag Analysis

For this analysis, dyadic gaze states were created by combining each direction of baby gaze with each direction of mother gaze. Results from two data points at the middle of the first year (4 and 8 months) were combined, as were two data points from the middle of the second year (16 and 20 months). Event lag analysis (to 3 lags) was then performed using each state as the criterion event for every other state; probabilities and z scores were computed separately for each transition in each of the four different play situations for each combination of age levels. Results will be reported only for those transitions in which the matching event had an unconditional frequency of at least 9: this was chosen because it seemed to reflect a division point between states which occurred regularly and those which did not. Further analyses will obviously be needed with larger frequencies.

Play with No Toy

In no-toy play during the first year, the three dyadic states which were most characteristic of Dyad H (i.e., had a frequency of $\geq$ 9) were FF (mutual gaze), AF (baby looks away/mom looks at baby's face), and BF (baby looks at mom's body/mom looks at baby's face), with FF being the most characteristic. Lag analysis showed that FF occurred more than would be expected immediately following both AF and BF. H's mother thus closely monitored his face and was very likely to be rewarded by a look from him. In addition, FF occurred more than expected three lags after FB: given FB, the third state following it was more likely to be FF than would be expected, regardless of the two intervening states.

In Dyad B, the most common states in Situation 1 were AF, AB and FF, with AF being the most characteristic. In this dyad, lag analysis revealed very predictable cycling between states. AF was most likely to be followed by an alternating sequence of AB, AF and AB (to 3 lags). Mother B also closely monitored her baby's focus of attention, alternating between looks at his face and at his body (i.e., the back of his head). Further, given FF, the dyad was very likely to return to that state at lag 2 (after one intervening event). The most typical intervening event was FB; although this transition yielded a significant z, the low unconditional frequency of FB lessens the faith which can be put in any dependent relationship between FF→FB. However, it appears that here, too, Dyad B engaged in predictable cycling between FB and FF: given either, the other was likely to occur as the next event. Mother B thus broke mutual gaze by looking at the baby's body (for example, in a tickling game she might look at his tummy), and then reestablished it.

During the second year (16 and 20 months combined), play with no toy showed some interesting changes. In Dyad B (nonhandicapped), AF was still the most characteristic state, and was now the only state which occurred ≥ 9 times during these combined interactions; it was not found to be conditionally related to any criterion event at any lag. Dyad H (handicapped), in contrast, while retaining the same most characteristic states as at 4-8 months (FF, BF and AF), at 16-20 months showed similar contingent patterns to those found in Dyad B at 4-8 months. The most predictable sequence of events was FF → BF → FF. At the next lag, however, AA was the most likely event. Thus, the monitoring/mutual gaze cycle was likely to be broken by both looking away. This four-event sequence was a particularly strong one.

Also in resemblance to Dyad B at 4-8 months, the events following the criterion event AB were more predictable, with FF occurring significantly more than expected at lag 2. Again the mothers' monitoring was likely after 2 lags to end in mutual gaze.

Instruction with No Toy

At 4-8 months, state patterns of Dyad B in Situation 3 were similar to its patterns in Situation 1. The most characteristic states were AF and AB, as in Situation 1; FF, however, was not characteristic of this situation. Further, the same criterion events tended to be related to predictable matching events as were found in Situation 1. The cycles created by maternal monitoring, however, were no longer apparent. At lag 1, conditional relationships between AF and AB (i.e., AF→AB and AB→AF) occurred more than expected; unlike Situation 1, however, these were not cyclic. Events following BF and BB were more predictable than in Situaton 1, with each likely to be followed by AF. FF was also likely to be followed at lag 3 by AF. It appears that, while the mother's gaze behavior was similar in the two situations (monitoring of face and body), her instructional behavior made little difference in what Baby B attended to, except possibly to make his looking away more predictable. In contrast to Dyad B, Dyad H was very different in the two situations at 4-8 months. The most characteristic state was TT (mutual gaze at "object of the interaction," in this case the mother's hands or some other "non-toy" which she incorporated into the interaction). Only two transitions involving TT occurred significantly more than expected. TA was likely at lag 2 to be followed by TT, while TB was likely to be followed at lag 3 by TT. It appears that Mother H was able to create non-toy events which were interesting enough to hold her baby's visual attention; she was the one who changed direction of gaze while he continued to look at the "event."

At 16-20 months, patterns in Dyad B had changed little from those at 4-8 months. AF and AB were still the dyad's most characteristic states. Events following AF were especially predictable: not only did it follow itself at lag 2, but it did so regardless of where it appeared. Further, it was the most predictable event following AT, and then was very likely to occur again at lag 3 following AT. A very predictable sequence in this dyad was therefore AT → AF → x (some other state) → AF. In addition, both FB and BF were likely to be follwed by AB. Thus, in Situation 3, as at 4-8 months, Mother B was not able to hold her baby's attention to the interaction. The patterns of Dyad H at 16-20 months differed from the 4-8 month patterns in both characteristic states and in contingent relationships. FF and AF were the most characteristic states: the mother at this age level no longer used an "object of the interaction" to the same extent as at 4-8 months. Two different significant conditional relationships indicate why this may be so: at 16-20 months, TT was likely at lag 1 to be followed by AF, while TF was likely to be followed at lag 2 by AF. Thus, Mother B was not as successful in using an "object" to maintain her baby's attention as she had been at 4-8 months. The more "social" interactions appear to have been somewhat more successful in this respect and to also have been more successful in terms of establishing predictability than in the no instruction situation. While FF was most likely to be followed by AF, the reverse was also true. Further given AF, the most likely sequence in Situation 3 was then FF→AF→FF; it appears that in the instruction situation Mother H could not only capture her baby's attention, but could predict that his attention would cycle back when he looked away.

In Situation 1 and 3 (no toy situations) at both age levels, Mother H appears to have been more successful in maintaining her baby's involvement than was Mother B, and to have adapted her style of interaction across age levels. Instruction, as opposed to no instruction, seems to have improved predictability and social behaviors in Dyad H, while in Dyad B, it seemed to make non-interaction more likely.

Toy Play

Situation 2, in which the dyads played with toys, yielded very different patterns from the no toy situations, as might be expected. At 4-8 months, the most characteristic state for both dyads was TF. AF was also characteristic of Dyad H but not of Dyad B. The two dyads were also similar in the transitions in which TF was a significantly occurring matching event. Given a TF, the most likely event after an intervening event was to return to TF. Further, given TT or AB, the next most likely event was TF. These transitions, as in the no toy situations, suggest sequences in which the mother plays a monitoring role. The most likely sequence seems to be alternation between TT and TF.

At 16-20 months, TF was the state most characteristic of Dyad H, while Dyad B engaged equally in TF and TT. There was still a great deal of similarity between dyads, and between this and the younger age level as well. The monitoring role of the mother was still obvious in both dyads. In each, TF was followed by TT more than expected, and vice versa. Further, AB was most likely to be followed by TF, while AA was likely to be followed by TF at lag 2. The most predictable sequences in each dyad were thus AB→TF and AA→AB→TF. From a "mother monitor," or from a sequence of two states containing mother monitor, each dyad was more likely to return to one of its most preferred states, with each member changing simultaneously as if to say, "Well, that's over; let's get back to business as usual."

Instruction with a Toy

At 4-8 months, instruction (as compared to play) affected the two dyads differently. In Dyad B, TF was the most characteristic state; TT had a frequency of ≥ 9 as well. In this dyad, instruction was associated with even more predictable and longer sequences of cycling between TF and TT: once Baby B looked at the toy in instruction, he rarely looked away from it, and his mother looked back and forth between his face and the toy. This cycle was still highly significant where the analysis ended at lag 3. When Baby B did look away, and his mother monitored his body, TF was significantly more likely than usual at both lag 1 and lag 3, regardless of which state occurred at lag 2. Further, TF was more likely than expected at lag 2 following AA.

In the instructional interactions of Dyad H at this age level, no states occurred ≥ 9 times, and therefore we can place less confidence in the results for transitions. There is a strong indication, however, that the TT-TF cycle was shorter in instruction than in play, with the most likely sequences being TF→AF and TT→TF→AF. It appears that H's mother had good reason to continue watching his face rather than looking back to the toy. At lag 3 following TF, however, TT was more likely than expected, indicating that the dyad did get back to business, but only after 2-event "rest."

At the 16-20 month age level, TT and TF were characteristic of both dyads in the toy instruction situation. In Dyad B, gaze patterns occurring significantly more than expected were identical to those in the same situation at 4-8 months. Again, transitions were similar to those in toy play, but showed stronger and longer lasting cycles than in play. In Dyad H at 16-20 months, instruction differed from play more than at 4-8 months. The strong cycling between TT and TF resembled that in Dyad B in the same situation. States following AB and AA also resembled those found in Dyad B: AB was most likely to be followed at lags 1 and 3 by TF, while AA was most likely to be followed at lag 2 by TF. AT showed the same pattern. Thus, in this situation, as well as in play, the dyad was more successful at getting back to business than it had been at 4-8 months.

DISCUSSION

It was very obvious to all who were involved with these two dyads, just as it is clear from the data just presented, that each one, in its own unique and individual way, "worked." The developmental progress of each baby and the quality of affect in each baby/mother relationship demonstrated that each dyad was uniquely suited to be a dyad. How could such a thing occur? What seemed to account for this was a combination of not only the characteristics of each baby and of each family, but of the match between the two. It further seemed that the differences in what made these two unique dyads work pointed out some of the very real constraints on the mother and family of the handicapped baby that were discussed in previous sections.

It was our feeling that, in the case of B, a much wider range of variation in mothering would have been acceptable: what she wanted him to do, he generally did spontaneously, with little need for her to impose structure on their interactions. While she saw herself as a "teacher" this role was accomplished primarily through facilitating B's own initiatives.

Her role during interactions was one of "monitor and facilitate" rather than "direct," although the data demonstrated that she could more directly teach and could influence his focus of attention in toy situtions. One factor which could have created a problem with a different mother was B's early lack of interest in "social" (as opposed to the later "talking") situations. Here, too, B's mother tended to monitor and wait, interpreting his interest in the environment as intellectual curiosity, rather than as not being interesed in her. Within the everyday routine, purely social situations were rare, with interactions revolving around specific events (taking a walk) or objects. Overall, B's qualities and desires tended to be the dominant force in determining the characteristics of his interactions.

In contrast, H's developmental progress and the success of his interactions seemed so intricately related to the characteristics and interactive qualities of his mother and family that they would not have occurred in an environment which differed to any extent from his own. Our concern in studying the dyad became one of clarifying the qualities related to its success, both during interactions and in general, as an environment supportive of the baby's development.

In general, adaptation and role adjustment, naturally occurring and conscious, were found in many guises throughout the videotaped interactions and the everyday life of this family. For example, during toy interactions H's mother constantly monitored his face, changed the content as his interactions changed, and used much variety in her face and voice to hold his attention. She also honored his style, which was fairly slow paced, by being slow paced herself. At the same time, she did not overadjust to the point of allowing his behavior to dictate the course of the interaction. That is, unlike Mother B, she did not rely on H to self-direct, but rather had specific purposes in mind and specific strategies to use to maintain the interaction. Unlike Mother B, her role was thus not "monitor and facilitate," but rather "monitor and direct." Mother H did not feel free to follow H's lead, and rightly so: his least preferred activities were those most related to his relatively advanced physical and language development. As Baby H's interactions became more like B's at the later age levels, his mother became less directive. It is interesting that while both mothers defined their role as "teacher," the role was manifested in different ways in each dyad, and matched the capabilities of the babies.

Adaptation was obvious at the level of the family as well, and supported the mother's ability to assume the teacher role without excluding "play" from the life of the baby. That is, this family shared responsibility for a wide range of types of interactions. A similar role dispersal took place in Dyad B, with the father playing verbal/instructional games while the mother played rough and tumble.

It was our perception that Baby H's excellent developmental progress and emotional security were based on his being raised in an environment that treated him as an average kid, with the expectations, privileges and experiences of a average kid, coupled with unique adaptations to his individual style and needs. What is not clear is how much of this adaptation was elicited by H, and would have occurred with different parents. It is also not clear how much of this type of adaptation can be learned if it does not naturally occur.

When one considers the very individual personalities of the babies and families included in these two case studies, the picture which emerged had a remarkable resemblance to the results of Sub-study 1 in relation to styles of interaction, roles and interpersonal adaptation. The interactive styles of each mother, and the dyadic patterns which resulted from the integration of communicative behaviors, clearly illustrated the adjustment to individual differences that was necessary to maintain these interactions at an optimal level. In each dyad, success was accomplished in very different ways.

As in Sub-study 1, the handicapped dyad demonstrated the need for more than average sensitivity on the part of the baby's interactive partner; interaction was not automatic and effortless. Rather, it was much more dependent on the mother's conscious adjustment of her own role and interactive characteristics. Further, the same "instructor" role was apparent in the mother; in this case the possible negative effects were mitigated by role sharing within the family group. It was our feeling that this dyad and family demonstrated a combination of qualities which are critical in facilitating the optimal development of a handicapped baby.

It is not clear from comparison of these two dyads what effect particular types of handicaps will have on social interaction and on the interpersonal regulation of behavior. We would expect, however, that problems would both reflect the general results of Sub-studies 1 and 2 as reported here, and unique aspects of regulation and adaptation related to more specific handicaps. These impressions, as well as those related to the effects of particular family characteristics, will be explored in analyses of data from other dyads.

CHAPTER 4

SUB-STUDY 3: SINGLE CASE INTERVENTION

This third and final sub-study was designed to test the efficacy of intervening directly into the interactive process between baby and mother. A single subject design was used, with a multiple baseline across two target behaviors. The study was replicated (with some variations for individual dyads) across five dyads: results for three of these pairs will be reported here. In each case, baseline videotapes were made once a week for 3-5 weeks. Intervention was then applied to two parent behaviors, one at a time, with each phase lasting from 3-5 weeks, occurring once per week. Taping situations and the situation chosen as the intervention differed somewhat, depending on the needs of each dyad; most were 4-minute play interactions. In some dyads, two different situations were taped: one was used as the intervention situation while the other was used to test for generalization of effects. For one of the dyads, a follow-up videotape was made 9 weeks past the last intervention in order to test for maintenance. Dyads in this sub-study were referred for intervention by a case manager or some other professional who felt that social interactions in the dyad were a problem area.

PROCEDURE

In each dyad, target behaviors were chosen from observations of the baseline videotapes, and were based on discussions between the case manager, the researcher, and the masters degree student who had taped the baseline situations and who would act as the intervener for that dyad. Intervention sessions occurred in the dyad's home once per week, and followed a particular sequence. First, the segment of videotape made at the previous visit, using the intervention situation only, was viewed by the mother and intervener together. The intervener then discussed with the mother examples (from the tape) of instances in which she displayed (or approximated) the behavior being trained. These were verbally reinforced by the intervener, who also pointed out from the videotape examples of the desired corresponding infant behavior. Following intervention, the dyad was again videotaped in the same situations. (More specific details concerning this procedure and the philosophy underlying it are outlined in the "SIAI", presented in full in Appendix C.)

Data collection was based on observation of the videotapes, with the particular type of observational procedure used being chosen to reflect the particular target behaviors. Videotapes were viewed once through for each target behavior.

RESULTS AND VARIATIONS FOR EACH DYAD

Dyad J

The baby in this dyad was an 18 month old with severe cerebral palsy and a variety of other complications as well. The dyad was part of a 4-member, lower-middle income, single parent family. J was the youngest child. At the time at which intervention was begun, J exhibited few social behaviors.

The target identified for J from the initial videotapes was vocalization, while those for his mother were (a) moving her face close to his in a playful manner (Target 1), and (b) imitating his vocalizaton (Target 2). These two were chosen because while each seemed to be very effective in eliciting vocal responsiveness, neither was used extensively by the mother. The multiple baseline was across these two mothers behavior, with each target being addressed in one of the two consecutive phases.

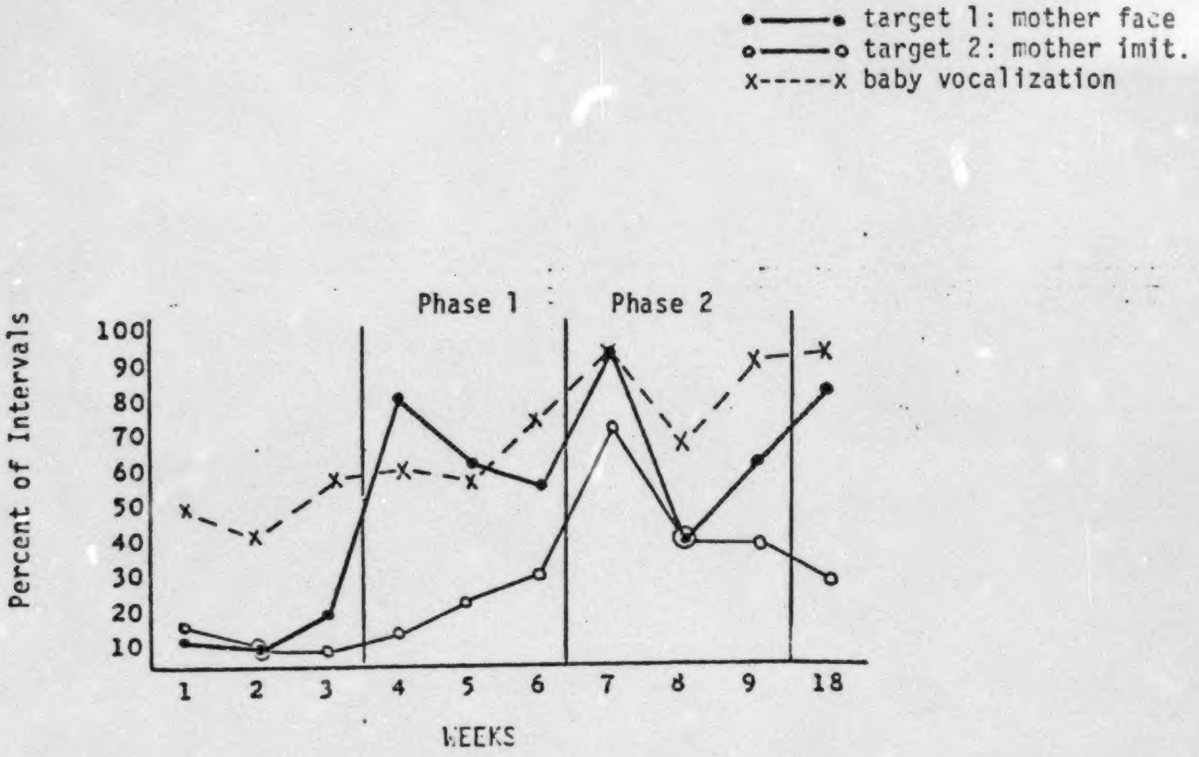
Baseline for this dyad lasted for 3 weeks, as did each intervention. A follow-up videotape was made nine weeks after the end of the intervention. In this dyad, three situations were taped at each visit, two of which, a toy play and a no-toy play, will be discussed here. The no-toy play situation was used for intervention, while the toy situation was used to measure generalization of any changes to a different type of interactive situation.

Interval sampling, using 10-second inervals, was used to code each of the target behaviors. Three and one half minutes constituted the sample coded for each visit. Results are illustrated in Figure 1a.

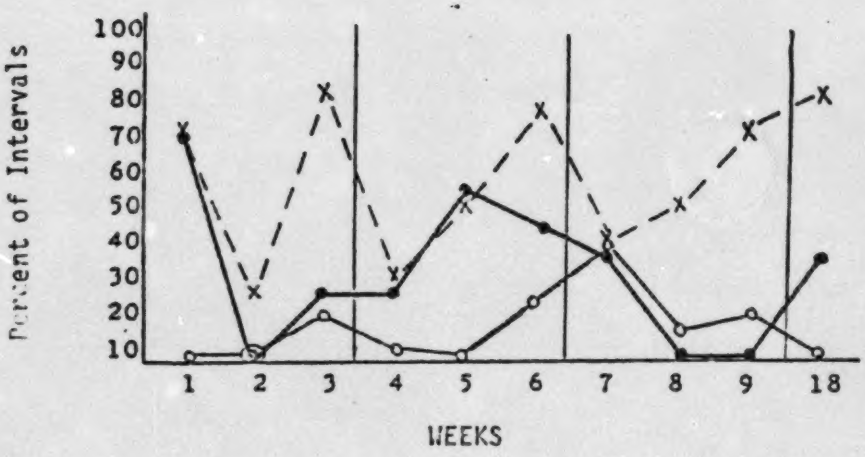
In the intervention situation (no-toy play) baseline observations of the first target behavior (mother's use of face) were fairly stable. During intervention, the data showed a definite upward trend. It was interesting that this behavior increased during the first session of each phase of the intervention (sessions 4 and 7), even though the second intervention was not directed toward it. Target 1 was still occurring in a higher percentage of intervals in the follow-up session taped nine weeks after the training period (week 18).

The mother's imitation of the baby's vocalizations, the target behavior in Phase 2 of the intervention, also remained fairly stable during baseline, and the mother responded positively to the first intervention session directed toward it (Session 7). There was evidence of a slight upward trend, although it was not as great as that found for the first target behavior, and appears to have begun a slight downward trend toward the end of training and in the follow-up session.

J's vocalization was not as stable during baseline as the mother's two target behaviors, yet a clear increase was seen following baseline. There



a) Dyad J in no-toy play: intervention situation



b) Dyad J in toy play: non-intervention situation

Figure 1. Dyad J in intervention and non-intervention situations.

was a steady upward trend throughout the training sessions; this was also carried over into the follow-up session. It is apparent that the intervention into the mother's behaviors had a considerable effect upon the overall amount of infant vocalization, although it would be difficult to determine whether the effect was related to any particular mother behavior or simply to an increase in overall maternal stimulation.

Data were also coded from videotapes of toy play sessions made at each session, and were used to test for generalization of targeted behaviors from the training situations to one which was different in its attributes. Results appear in Figure 1b. Target 1 (mother's use of face) was unstable during baseline. While there was no change in average occurrence during Phase 1, some generalization does seem to have occurred, but to have dropped out fairly rapidly. The mother's use of vocal imitation (Target 2) remained fairly stable during baseline (always below 20%). There was a slight increase in this target skill (19%-33%) at one of the Phase 2 sessions (session 8), but after this the behavior declined to a level similar to that represented in the baseline tapings. In the follow-up session the percent of occurrence was at the same level as during the first two baseline sessions (zero). Thus, there seem to have been only momentary generalization effects for each of the mother targets. Infant vocalization in the toy play situation was extremely erratic and showed only a slight upward trend throughout the training period.

The results for this dyad indicate that each of the mother behaviors chosen as targets were affected by intervention, but primarily only in the no toy situation (the intervention situation). This particular mother seemed very responsive to the idea of "intervention" in general; this effect was seen in the greater amount of activity which occurred during the first intervention session for each behavior, and particularly in the increase in the first target behavior at the first session for the second target behavior. Overall, the mother became more active and responsive, and it was clear that the baby's vocalization was affected by one or both mother behaviors; this is supported by the mutual non-increase in mother and baby behaviors in the toy play situation. It was the impression of the interventionist that imitation of vocalization was a more difficult skill for the mother, and that more sessions would be needed to make that behavior a part of her regular interactive repertoire. The mother reported that she was able to get more response from J, and that he was in general more fun to play with. She also reported that his sibings were using the same targeted strategies when they played with him.

Dyad K

The baby in this dyad was a 34 month old girl, a twin who also had one older and one younger sibling. While K's twin was developing normally, K had no language and displayed little vocalization. Play with toys was inappproprite, consisting of mouthing, banging, or simply holding. "Play" interactions between K and her mother were generally characterized by "doing nothing" together. That is, K would sit in her mother's lap and look around while her mother tried to interest her in toys, primarily by physically putting her hands through the motions. Very little enjoyment was evidenced by either partner; K seemed content to sit, while her mother alternated periods of activity and inactivity. K's mother gave the impression of asking, "You say I'm supposed to play, but what in the world am I supposed to do?"

Baseline lasted for 5 weeks, while intervention into each targeted mother behavior lasted for 3. Targets chosen for the mother were directed toward helping her become more relaxed and playful with K. The Phase 1 target was for the mother to use turntaking, and was chosen as one aspect of "playfulness" which would be easy for the mother to identify and practice. The second target was more general play behavior, and was defined as a combination of smiling plus any one more of the following: "play talk", self-talk, turntaking, pretending, or taking a child's role in play. The multiple baseline occurred across these two targets. Two targets were also chosen for K, and included vocalization ad appropriate actions with objects. In this dyad, toy play was the only situation coded; unlike Dyad J, toy play was used as the intervention situation. Interval sampling using 5 second intervals was used to code 3 minutes (40 intervals) of each of the target behaviors. Results are illustrated in Figure 2.

Baseline observations for Target 1 (turn-taking) were fairly stable, and the behavior showed a definite response to intervention. It was our impression that in order to take turns, the mother had to watch K more closely; it seemed significant that, beginning in session 6, she positioned herself and K so that they were more face to face, with the toy accessible to both of them. Turntaking was thus physically more possible. One unforeseen problem encountered with turntaking as a target was that K did very little for her mother to take turns with, hardly ever vocalizing or engaging in independent actions with the toys. With intervention, even though turntaking occurred (and K's appropriate play with the toy increased as well), the sessions still looked like work rather than play, and little real enjoyment was evident.

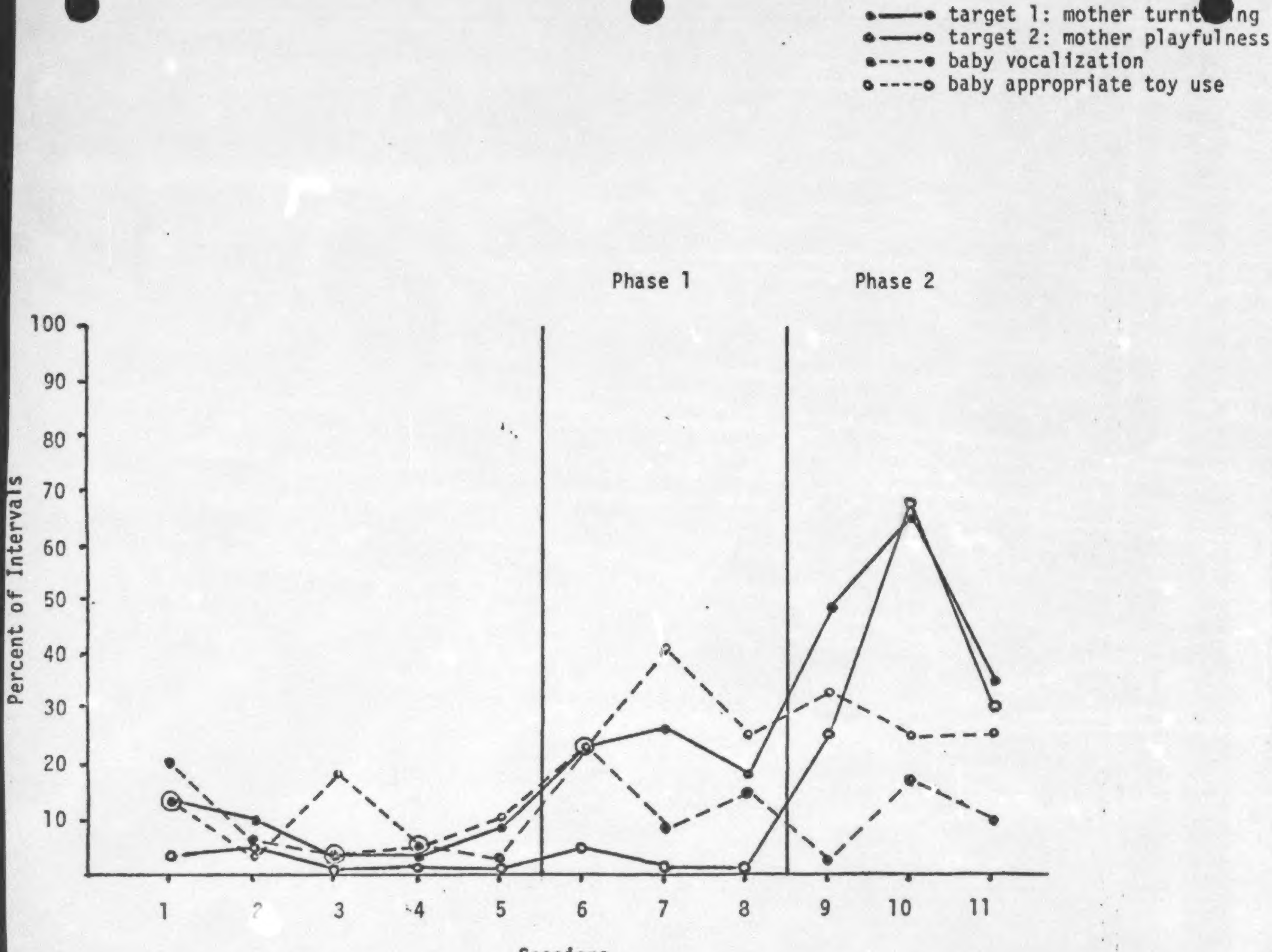


Figure 2. Dyad K in toy play: intervention situation.

Interaction into the second target during Phase 2 resulted in a more satisfactory outcome. Measures of "Playfulness" were extremely low and stable during baseline, which, for this target, lasted for 8 sessions. During intervention it showed a dramatic increase. In Session 10, in particular, K's mother was relaxed and smiling. It was almost as if she needed to be told that "play" was all right, and that it was not only appropriate but desirable that she enjoy herself. Both target behaviors for the mother were thus clearly affected by the intervention. For this mother, the more complex skill seemed easier to identify and implement than did a single component of it; it was clear, however, that turntaking was incorporated as an element of more general playfulness during the second phase of the intervention. While turntaking was not always playful, nor did playfulness always include turntaking, the two often did overlap, as might be expected, and the incidence of turntaking remained high during the second phase of the intervention period. Further, it was clear that K's appropriate play with toys was related to her mother's playful participation in the interaction. These particular mother targets, however, were not related to the amount of vocalization which K engaged in; it would be desirable to select a different maternal target to further address this objective.

While it was not one of the targets chosen, changes in the level of affect were very obvious in this dyad. Smiles, happy faces and relaxed body positions would have shown definite increases. It was our impression that the tenseness and nonenjoyment of the intitial interactions were based primarily on the mother's insecurity in not knowing how to interact with K; she seemed especially uncomfortable with toys, equating "toy" with "teach".

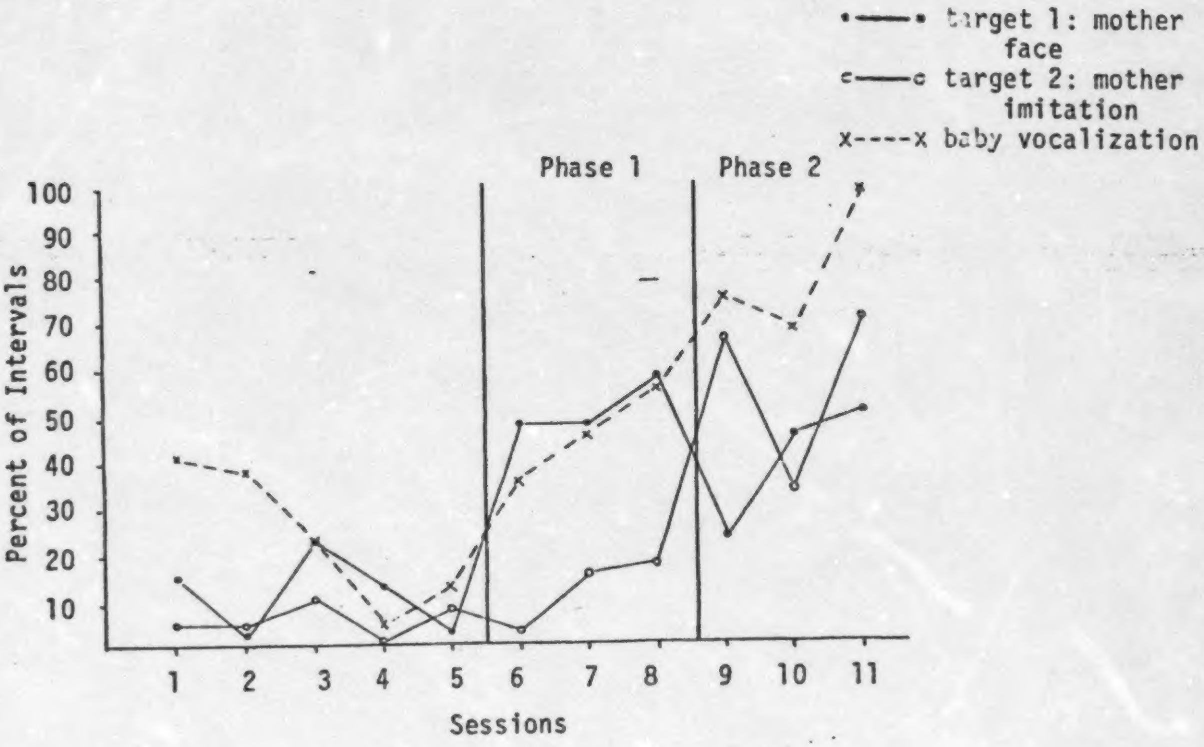
The home teacher who was working with this family reported that, once K's mother discovered this more relaxed approach to interaction, she rarely returned to her more tense earlier mode. And, while no causal link can be claimed, K almost immediately began vocalizing to a much larger extent and soon thereafter began to use words.

Dyad T

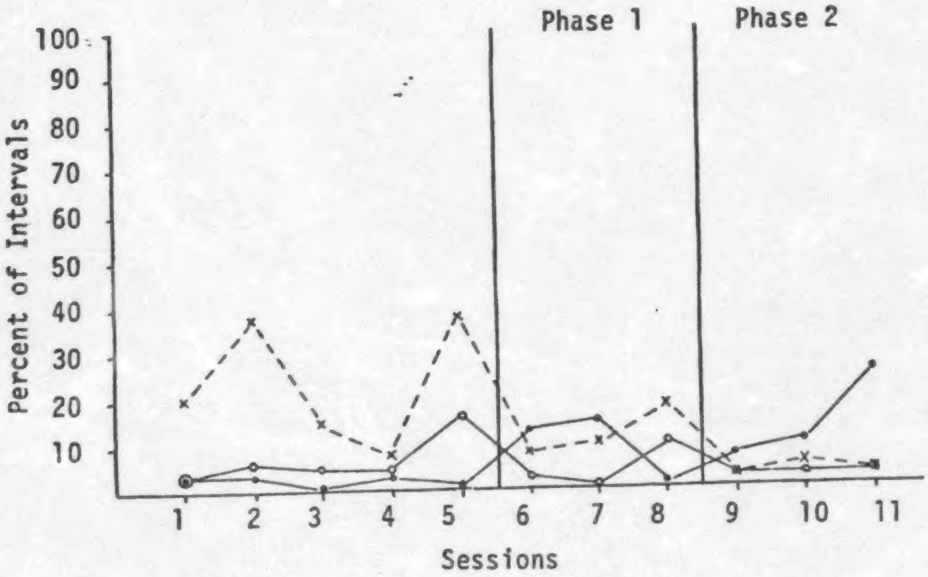
The baby in this dyad (T) was a 2 month old boy with one older sibling. T was not handicapped. The dyad was selected for intervention because of the baby's low levels of vocalization and the mother's low affect. Both parents were graduate students.

The target identified for T was vocalization. Targets chosen for the mother from the initial videotapes were (a) to use animated facial expressions (e.g., raised eyebrows, "0" mouth, crinkle face, etc., and (b) to imitate T's vocalizations. Baseline lasted for 5 weeks, while intervention lasted for six, with three weeks per behavior. As in Dyad J, a no toy play situation was used for intervention while toy play was videotaped in order to assess generalization. The intervention procedure used was identical to that described above and in Appendix C (SIAI). Data were coded in 5-second intervals, and summarized as percent of intervals. Results appear in Figure 3.

Target 1 ("animated face") showed a dramatic response to intervention. During baseline, the mother's face tended to be largely expressionless. When she did change expression, it was generally in response to some prior act of the baby's; she thus waited for the baby to initiate interaction. With intervention, she began to use different expressions to gain his interest and participation, and was quite effective in doing so.



a) Dyad T in no-toy play: intervention situation.



b) Dyad T in toy play: non-intervention situation

Figure 3. Dyad T in intervention and non-intervention situations.

During baseline, the baby was not only unusually quiet, but those noises which he did make were barely audible, tiny little noises: all noises except crying and fussing were counted. With increases in the mother's range of facial expression, the baby also became much more animated as well, and his vocalizations increased not only in quantity but in variety and volume as well. As in Dyad J, however, it was hard to tell exactly what the change in the baby's behavior was related to. The mother not only increased in facial expressiveness, but also increased the amount of vocalizing which she did: raised eyebrows and more talk invariably occurred together.

Except for a depression at Session 9, when she was concentrating on Target 2 for the first time, the mother continued to be more animated than she had been during baseline. It was clear throughout Phase 2 that T's mother continued to try to incorporate the first target into the play sessions. At times she would suddenly "remember", and her eyebrows would go up even when the moment was not entirely appropriate.

Intervention directed at Target 2 (mother imitation of the baby's vocalization) also indicated that the intervention procedure was successful in changing social interaction. As shown in Figure 3a, during only one baseline session (#3) did the mother imitate T's vocalizations to any extent. It was also clear, however, that T in general made few vocalizations which she could imitate. It is interesting, however, that although T's vocalizations increased during Phase 1, his mother's imitation did not; thus, it was not solely the lack of opportunity which prevented her from doing so. During Phase 2, not only did her imitations increase; they also closely paralleled the profile for the amount of T's vocalizations. An especially noteworthy aspect of the baby's vocalization was that when his mother used either of the targets, his sounds became more social in nature, and included ecstatic bursts of gurgling and laughter. Another interesting aspect was that she often imitated his intonation, rather than his exact sounds. Generally, his sounds were somewhat difficult to imitate, as they contained few vowel sounds, and were mostly gutteral or lip smacking. The mother even commented to him, "I can't make those silly sounds!" The overall feeling of these final interactions was very different from those taped during baseline, with much laughter, turntaking and "togetherness."

Very little generalization was seen in the toy situation. If anything, the baby's vocalization tended to become less frequent over time, and only the mother's exaggeration of her facial expression showed any inclination to be used in the toy situation. Very different factors seemed to be at work than in the older dyad (Dyad K). During baseline sessions (which were also the youngest age levels), T seldom showed any interest in the toys which his mother presented. While he would stare at them for a short time, it was clear that he was much more interested in his mother. The most successful interactions with toys were those in which the two members were each on their stomachs on the floor, face to face, with the toy in between: face and toy were on the same plane. As in the no toy situation, T's vocalizations during baseline were "tiny noises," and his mother generally showed little expression, simply holding the toy in front of him and moving it around. Changes in T's vocalization seemed to be more a function of his development, of increasing interest in the toy, rather than of his mother's interactive behaviors.

DISCUSSION

It was quite clear from watching these three dyads (as well as ones not reported on here) that when interactions don't work very well, not only do they not pleasurable for either participant, they also do not possess characteristics conducive to their continuation or to the baby's optimal development. It was found that such interactions could be affected for the better through direct intervention into interactive behaviors displayed by the mothers; their behaviors then became the interventions directed at their babies' behavior. Not only were the mothers able to acquire these behaviors, they also incorporated them into their later interactions, as evidenced by the carryover of Target 1 into the Phase 2 intervention sessions.

The need for thinking of each dyad as unique became increasingly evident during the course of these interventions. While the target behaviors often included elements of "play," they were evidenced differently in each dyad. Appropriate targets could only be chosen from direct observation of several interactive sessions. Another aspect of changing individual targets was related to the types of situations in which problem interactions typically occurred, and which therefore became the situations used for interaction. Individualizaton was also necessary in the actual procedure used in intervention, and in fact more flexibility was desirable than was possible to use in this research. A change in the target, or a different emphasis in procedure, was sometimes called for. For example, one mother was particularly threatened by watching the intervener model the targeted behavior; it would have been better to eliminate this part of the instruction. In other cases, it became evident that baseline procedures were taking too long: the mothers wanted to get on with it! in clinical application such changes would be very appropriate.

Generalization from no toy situations to toy situations did not occur to any great extent. Social interaction would not be expected to occur to the same extent in a toy situation. However, when mothers and babies are both involved with the same toy, some interaction will occur; it seems reasonable to expect that the same skills would appear in that situation as well. Such was rarely the case, and the reasons for this need further study. Either the different types of situations demand different skills to a larger extent than we expected, and/or training needs to be extended to additional situations. It is clear from the results of Sub-study 1 that toy play probably becomes less social over the course of the first year of life as the baby's interest shifts from social objects (mother) to other objects in his environment. Once he is able to combine these two foci of his attention, the more social aspects of toy play should again become apparent, but may appear in different forms. That is, the mother may have to learn to play different types of roles in order to take an active part in the situation. Another aspect of generalization not dealt with in this research concerns that of transfer of changes in behavior from the intervention situation to the everyday environment. In other dyads not reported here, we have found that this also does not occur automatically. However, one very simple and effective way which was found to increase the amount of transfer was to discuss with the mother examples of how and when the skill could be used at different points in the household routine.

While the need to be flexible in adjusting targets and approaches was clear, there were various aspects of the procedures used which seemed particularly important to the success of the interventions reported here. These are outlined in the SIAI (Appendix B), but in general included (a) the selection of targets which were already in the mother's repertoire, albeit of low occurrence, (b) active involvement of the mother in pinpointing instances of target behaviors from the videotapes, and (c) direct practice of the behavior with reinforcement by the intervener. Each of these helped not only to insure success, but to encourage the mother to become generally more sensitive to her own behavior in relation to the baby's.

It is possible that in these "problem" interactions the dyads would have automatically changed for the better as the babies developed and grew; however, it seems more likely that a negative cycle would result, affecting both the quantity and quality of the interactions which did occur. It is hard to imagine, for example, that either K or her mother were gaining very much from their play, either in terms of immediate mutual pleasure or in terms of K's learning. Intervention seems critical if secondary and cumulative delays are to be prevented.

While it is clear from these results that intervention can change the nature of social interaction in relation to making it more pleasurable and more "communicative" for both partners, we do not know whether these changes will have any long-term effect in terms of whether the interactions can fulfill normal functions in facilitating th baby's development. It seems highly likely that, to the extent that more pleasurable interaction occurs, they would at least increase the interactive situations in which the baby would be engaged, and thus his opportunities to gain the types of knowledge and skills which normally occur in these situations. We also do not know what effect the changing characteristics of the baby will have in relation to the mothr's ability to continually readjust her own interaction over time. We suspect, however, that interactions with handicapped babies will not become truly reciprocal in the same sense as in dyads with nonhandicapped babies; rather, the need for continual readjustment to babies with changing but still "different" characteristics would be expected. As new differences surface, intervention may be needed to deal directly with new problems in interpersonal regulation and role definition.

CHAPTER 5

SUMMARY OF OBJECTIVES FOR PROJECT ADMINISTRATION

TIMELINE

Instrument development, data collection and data analysis in relation to the research questions were all implemented as proposed. Because of some delay in finding a complete group of handicapped babies, however, data collection lasted much later into the project than had been expected, delaying analysis and interpretation as well. It was therefore decided that analysis should proceed in relation to all research questions, but using only selected portions of the data. In this way it was possible to develop procedures for data storage and for different types of comparative and sequential analyses which will continue to be used for analyzing and interpreting the remainder of the data. These decisions, described in the project continuation proposals for the second and third years, and further described in this report, have proven to be very beneficial. It has been possible to address each of the research questions to some extent; results of further analyses will continue to add information to these same questions.

In general, then, all aspects of the projected timeline were accomplished. At the level of analysis and interpretation, however, this was not in the depth that we would have liked. This work will continue after the termination of this project.

DISSEMINATION

Presentations

Dissemination of different aspects of this project have occurred at local, state and national levels. These include:

Fall, 1980	An inter-agency symbiosis. Illinois CEC, Chicago, IL.
Fall, 1980	Research and practice in parent/infant interaction and family involvement. The Association for Severely Handicapped (TASH), Los Angeles, Calif.
Spring, 1981	Social interactions with deaf-blind babies. Society for Research in Child Development (SRCD), Boston, Mass.
Spring, 1981	Intervention into social interaction. Society for Research in Child Development (SRCD), Boston, Mass. (with Laurel Bushman)
Spring, 1981	Social interaction research with infants. First annual ECEH Conference, Aurora, Ky.
Spring, 1983	Parent-infant social interaction: A procedure for assessment and intervention. Council for Exceptional Children (CEC), Detroit, Mich.
Spring, 1983	Social interactions between parents and handicapped babies. Governing Board, Developmental Services Center, Champaign, IL.

Writing

Walker, J. A., & Kershman, S. B. Deaf-blind babies in social interaction: Questions of Maternal Adaptation. ERIC ED #214-349, 1981.

Walker, J. A. & Crawley, S. B. Conceptual and methodological issues in studying the handicapped infant. In Garwood, S. G., & Fewell, R. R. (Eds.), *Educating handicapped infants: Issues in development and intervention*. Rockville, Md.: Aspen Systems Corp, 1983.

McCollum, J. A. Looking patterns of handicapped and nonhandicapped babies in play and instruction with mom. Submitted for publication.

McCollum, J. A. Social Interaction Assessment and Intervention (SIAI): A manual. Champaign, IL.: Department of Special Education, 1982.

Writing in Progress

McCollum, J. A. Doing what comes naturally.

McCollum, J. A. Maternal adjustments to looking patterns of handicapped and nonhandicapped babies in play and instruction.

McCollum, J. A. Sequential analysis of dyadic gaze states in instruction and play.

Other Project Materials

All instrumentation is available for dissemination, including codes and rating scales. A procedural manual for all aspects of training, data summary and data analysis has also been developed.

PROJECTED CONTINUATION OF PROJECT GOALS

Five graduate students have completed or are completing theses and dissertations which are directly related to the questions of concern in this project. Three of these students expect to continue this line of research in the future. The Principal Investigator (Jeanette A. McCollum) has received a research appointment in the Bureau of Educational Research within the College of Education at the University of Illinois for the 1983-84 year for the purpose of completing further analysis and interpretation of the data gathered through this project.

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